



# SERVICE MANUAL

DUAL BAND FM TRANSCEIVER

**IC-3220A**  
**IC-3220E**  
**IC-3220H**

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## INTRODUCTION

This service manual describes the latest service information for the **IC-3220A/E/H** DUAL BAND FM TRANSCEIVER at the time of publication.

MODEL	VERSION NO.	VERSION	SYMBOL
IC-3220A	#05	U.S.A.	USA
	#07	Australia	AUS
	#08	Asia	SEA
IC-3220E	#02	Europe	EUR
	#03	Italy	ITA
IC-3220H	#02	Europe	EUR-H
	#03	Italy	ITA-H
	#05	U.S.A.	USA-H
	#07	Australia	AUS-H
	#08	Asia	SEA-H

## DANGER

**NEVER** connect the transceiver to an AC outlet or to a DC power supply that uses more than 16 V. This will ruin the transceiver.

**DO NOT** expose the transceiver to rain, snow or any liquids.

**DO NOT** reverse the polarities of the DC power supply when connecting the transceiver.

**DO NOT** apply an RF signal of more than 20 dBm (100 mW) to the antenna connector. This could damage the transceiver's front end.



This picture shows the IC-3220H version.

## ORDERING PARTS

Be sure to include the following four points when ordering replacement parts:

1. 10-digit order numbers
2. Component part number and name
3. Equipment model name and unit name
4. Quantity required

### < SAMPLE ORDER >

1120001650 IC TK10487MTR IC-3220A/E/H MAIN A UNIT 5 pieces  
8810006010 Screw FH M3×5 ZK BS IC-3220A/E/H Top cover 10 pieces

Addresses are provided on the inside back cover for your convenience.

## REPAIR NOTES

1. Make sure a problem is internal before disassembling the transceiver.
2. **DO NOT** open the transceiver until the transceiver is disconnected from the power source.
3. **DO NOT** force any of the variable components. Turn them slowly and smoothly.
4. **DO NOT** short any circuits or electronic parts. An insulated tuning tool **MUST** be used for all adjustments.
5. **DO NOT** keep power ON for a long time when the transceiver is defective.
6. **DO NOT** transmit power into a signal generator or a sweep generator.
7. **ALWAYS** connect a 40 dB~50 dB attenuator between the transceiver and a deviation meter or spectrum analyzer when using such test equipment.
8. **READ** the instructions of test equipment thoroughly before connecting equipment to the transceiver.

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<p>To upgrade quality, all electrical or mechanical parts and internal circuits are subject to change without notice or obligation.</p>
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# SECTION 1 SPECIFICATIONS

## GENERAL

- Frequency coverage

VERSION	VHF	UHF
U.S.A.	140.000~150.000* <sup>1</sup> (Tx) 136.000~174.000* <sup>1</sup> (Rx)	440.000~450.000
Italy	136.000~174.000* <sup>1</sup>	400.000~479.000* <sup>2</sup>
Europe	144.000~146.000	430.000~440.000
Australia	144.000~148.000	430.000~440.000
Asia	140.000~150.000* <sup>1</sup> (Tx) 136.000~174.000* <sup>1</sup> (Rx)	430.000~440.000

Unit: MHz

\*1 Specifications guaranteed for 144.000~148.000 MHz.

\*2 Specifications guaranteed for 430.000~440.000 MHz.

- Tuning step increments
- Number of memory channels

5, 10, 12.5, 15, 20, 25 kHz or 1 MHz

	VHF	UHF
Memory channels	18	18
Call channels	1	1
Scan edge channels	2	2

- Mode
- Antenna impedance
- Acceptable external power
- Usable temperature range
- Dimensions

FM (F3)  
50  $\Omega$  unbalanced  
13.8 V DC  $\pm$  15 %  
-10°C ~ +60°C (+14°F ~ +140°F)  
140 (W)  $\times$  40 (H)  $\times$  195 (D) mm  
5.5 (W)  $\times$  1.6 (H)  $\times$  7.7 (D) in  
(projections not included)

- Weight

1.4 kg (3.1 lb)

## TRANSMITTER

- Modulation system
- Max. frequency deviation
- Spurious emissions
- Microphone impedance
- Output power and current drain (at 13.8 V DC)

Variable reactance frequency modulation  
 $\pm$  5 kHz  
Less than -60 dB  
600  $\Omega$

		IC-3220A/E		IC-3220H	
		POWER	CURRENT	POWER	CURRENT
VHF	High	25 W	7.0 A	45 W	10.0 A
	Low-2	10 W	4.5 A	10 W	5.0 A
	Low-1	1 W	2.5 A	5 W	4.0 A
UHF	High	25 W	8.0 A	35 W	10.0 A
	Low-2	10 W	5.0 A	10 W	6.0 A
	Low-1	1 W	3.0 A	5 W	4.5 A

## RECEIVER

- Receive system
- Intermediate frequencies
- Sensitivity
- Squelch threshold sensitivity
- Selectivity
- Spurious rejection ratio
- Audio output power
- Current drain
- Audio output impedance

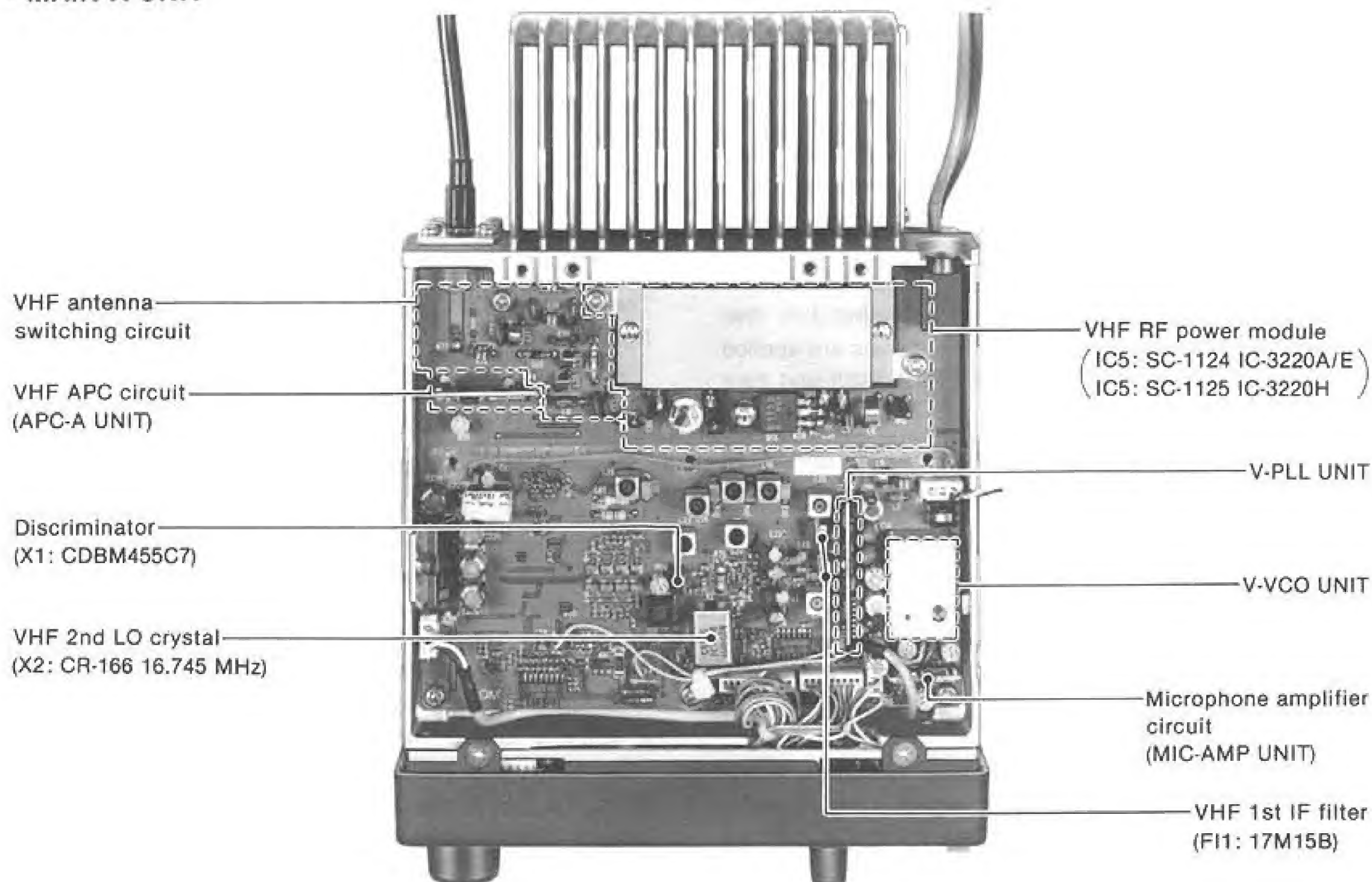
Double conversion superheterodyne  
1st 17.2 MHz (VHF)  
30.875 MHz (UHF)  
2nd 455 kHz  
Less than 0.16  $\mu$ V for 12 dB SINAD  
Less than 0.13  $\mu$ V  
More than 15 kHz/-6 dB  
Less than 30 kHz/-60 dB  
More than 60 dB  
More than 2.4 W at 10 % distortion with an 8  $\Omega$  load  
Max. audio output 1.2 A Squelched 800 mA  
4~8  $\Omega$

All stated specifications are subject to change without notice or obligation.

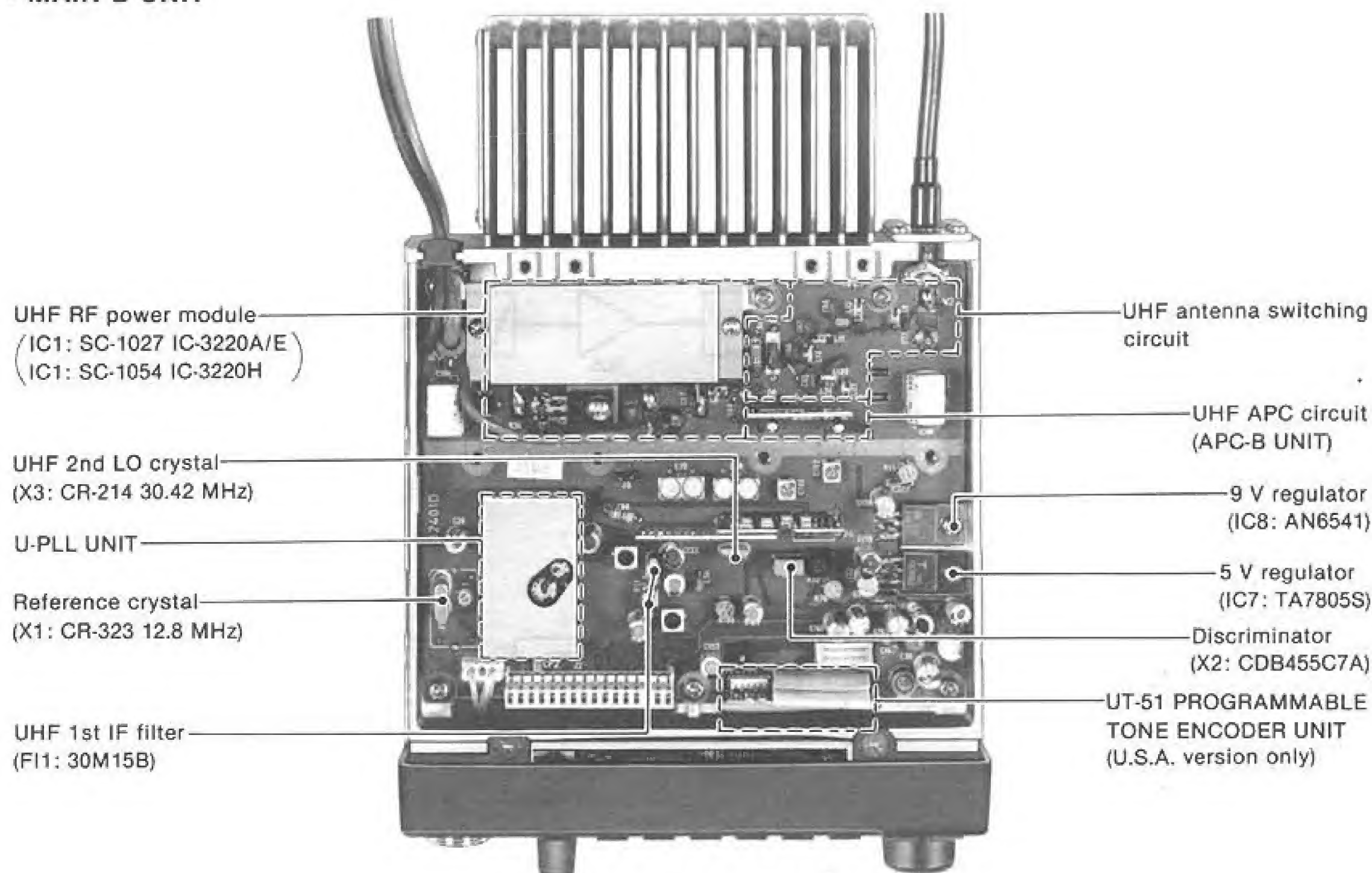


## SECTION 2 INSIDE VIEWS

### • MAIN A UNIT



### • MAIN B UNIT



## SECTION 3 CIRCUIT DESCRIPTION

### 3-1 RECEIVER CIRCUITS

#### 3-1-1 VHF ANTENNA SWITCHING CIRCUIT (MAIN A UNIT)

The antenna switching circuit is a low-pass filter while receiving and a resonator circuit while transmitting. The circuit does not allow transmit signals to enter receiver circuits.

Received VHF signals pass through a Chebyshev low-pass filter (C70~C72, L10~L12). The signals are applied to the antenna switching circuit (D7, D19, D20) and then to the VHF RF circuit.

#### 3-1-2 VHF RF CIRCUIT (MAIN A UNIT)

The signals from the VHF antenna switching circuit pass through a tuned bandpass filter (L19, C87~C90, D17), and are applied to the RF amplifier (Q35). Amplified signals are applied to a three-stage tuned bandpass filter (L16~L18, C99~106, D13~D15), and are then applied to the VHF 1st mixer (Q34).

The tuned bandpass filter circuits tune the filters to the center frequency of the receiving signal using varactor diodes (D13~D15, D17). A PLL lock voltage is used for the filter tuned signal.

#### 3-1-3 VHF 1ST MIXER CIRCUIT (MAIN A UNIT)

The signals from the VHF RF circuit are mixed at Q34 with the signal coming from the V-VCO circuit to produce a 17.2 MHz 1st IF signal.

#### 3-1-4 1ST IF CIRCUIT (MAIN A UNIT)

The 1st IF circuit contains an IF filter and IF amplifier. The 1st IF signal passes through the IF filter (F11), and is then amplified by the IF amplifier (Q18).

The IF filter consists of a pair of crystal filters in order to obtain wide selection capability and to pass only the desired signal.

The limiter diode (D11) protects the following circuits from strong signals.

#### 3-1-5 2ND IF AND DEMODULATOR CIRCUITS (MAIN A UNIT)

The 1st IF signal amplified at Q19 is applied to FM IF IC (IC4, pin 20). IC4 contains a mixer, an oscillator, a limiter amplifier, a quadrature detector, a noise amplifier and meter detector circuits.

The 1st IF signal which enters IC4 (pin 20) is mixed with the oscillated signal using X2, and is converted to a 455 kHz 2nd IF signal. The 2nd IF signal is output from pin 4, and passes through the ceramic filter (F12). Then, the 2nd IF signal re-enters IC4 (pin 6). The signal passes through the 2nd IF amplifier and a limiter, and then enters the quadrature detector where it is converted to AF signals. The AF signals "DETV" are output from IC4 (pin 11) and enter IC6a.

#### • VHF RECEIVER BLOCK DIAGRAM

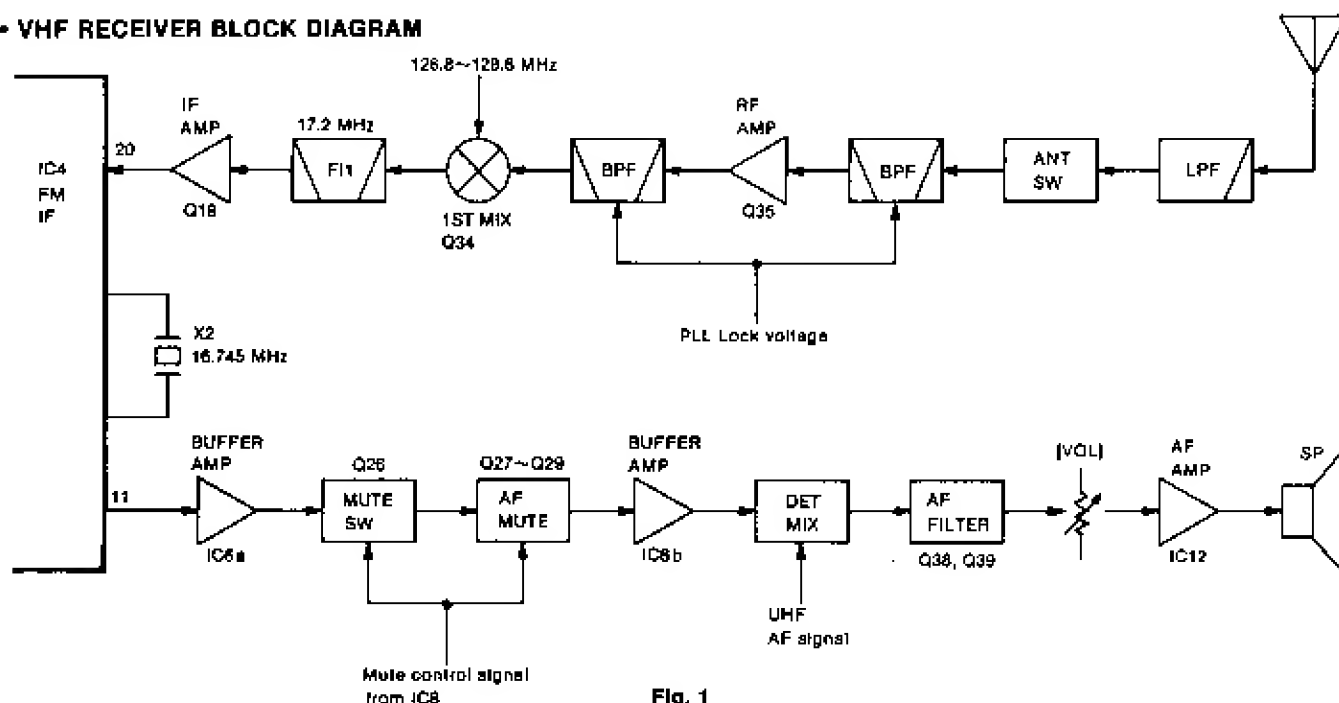


Fig. 1

### 3-1-6 VHF AF BUFFER AMPLIFIER (MAIN A UNIT)

The detect signals from IC4 (pin 11) are buffer-amplified by IC6a, and then pass through the mute switch (Q26). Then, the signals are buffer-amplified by IC6b and enter an AF filter circuit. The mute switch is controlled by IC8.

The AF attenuator circuit (Q27~Q29, R119~R121) is activated when VHF is sub band.

### 3-1-7 UHF ANTENNA SWITCHING CIRCUIT (MAIN B UNIT)

Received UHF signals pass through the high-pass filter (L12, L13, C69~C71) and then through the low-pass filter (L10, L11, C66~C68). The signals are applied to the antenna switching circuit (D8, D13, D14) and then to the UHF RF circuit.

### 3-1-8 UHF RF CIRCUIT (MAIN B UNIT)

The signals from the UHF antenna switching circuit are applied to the RF amplifier (Q18). Then, they pass through the bandpass filter (L20), and are applied to the 2nd RF amplifier (Q17). Amplified signals are applied to the bandpass filter (L19), and then applied to the UHF 1st mixer (Q16).

The coils in the bandpass filters use a double tuned helical coil. They have good bandpass characteristics and eliminate signals outside of the range.

### 3-1-9 UHF 1ST MIXER CIRCUIT (MAIN B UNIT)

The signals from the UHF RF circuit are mixed at Q16 with the signal coming from the U. VCO circuit to produce a 30.875 MHz 1st IF signal.

### 3-1-10 UHF 1ST IF CIRCUIT (MAIN B UNIT)

The 1st IF circuit contains an IF filter and IF amplifier. The 1st IF signal passes through the IF filter (F11), and is then amplified by the IF amplifier (Q14).

The limiter (D9) protects the circuit from strong signals.

### 3-1-11 UHF 2ND IF AND DEMODULATOR CIRCUITS (MAIN B UNIT)

The 1st IF signal amplified at Q14 is applied to pin 20 of the FM IF IC chip (IC5, pin 20).

The 1st IF signal which enters IC5 (pin 20) is mixed with the oscillated signal using X3, and is converted to a 455 kHz 2nd IF signal. The 2nd IF signal is output from pin 4, and passes through the ceramic filter (F12). Then, the 2nd IF signal re-enters IC5 (pin 6). The signal passes through the 2nd IF amplifier and a limiter, and then enters the quadrature detector where it is converted to AF signals. The AF signals "DETU" are output from IC5 (pin 11) and enter the AF buffer-amplifier (IC7a on the MAIN A UNIT).

### 3-1-12 UHF AF BUFFER CIRCUIT (MAIN A UNIT)

The detect signals from IC5 are buffer-amplified by IC7a, and then pass through the mute switch (Q30). Then, the signals are buffer-amplified by IC7b and enter the AF filter. The mute switch is controlled by IC8.

The AF attenuator circuit (Q31~Q33, R124~R126) is activated when UHF is sub band.

### • UHF RECEIVER BLOCK DIAGRAM

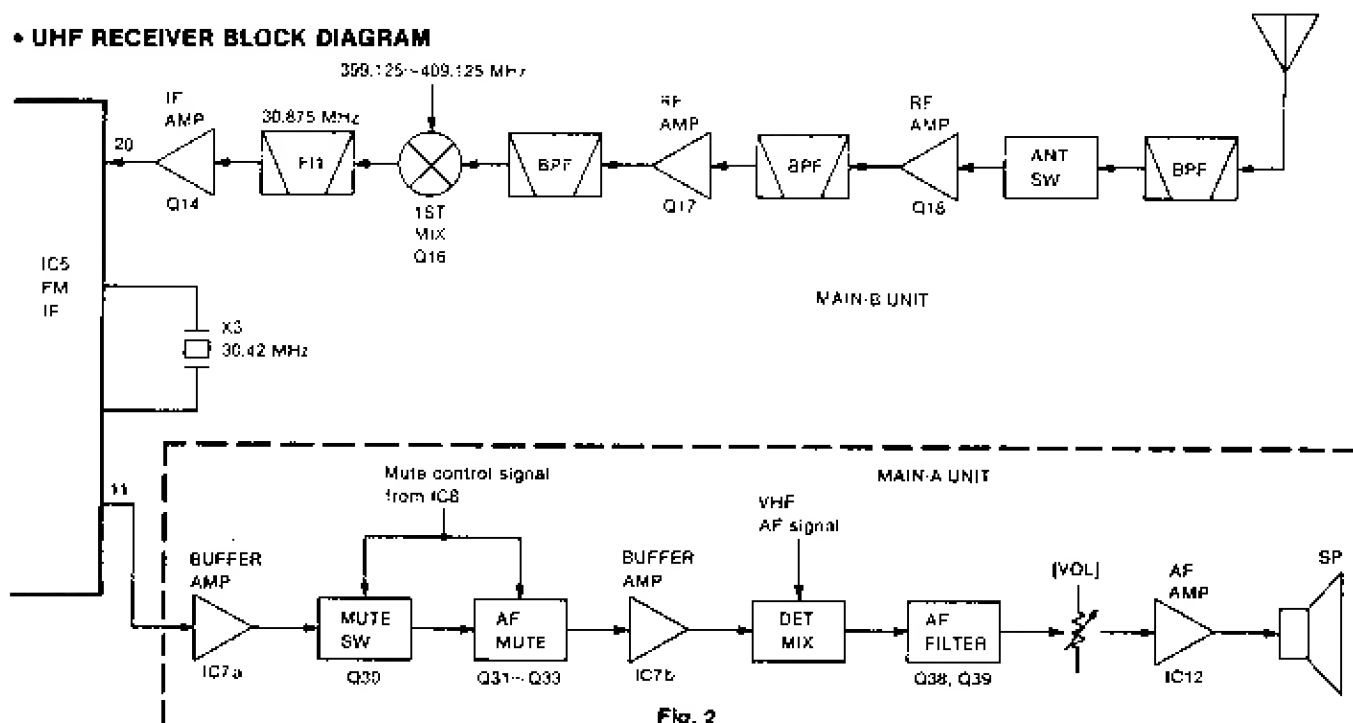


Fig. 2

### 3-1-13 AF CIRCUIT (MAIN A UNIT)

The signals, DETV and DETU are mixed, and then enter the AF filter (Q38, Q39). The AF filter suppresses the tone signal for tone squelch. The signals from the AF filter are adjusted by the [VOL] control, and are then amplified in the AF amplifier (IC12) to obtain the speaker driving level.

An AF mute transistor, Q44, cuts the input signals of the AF amplifier when the transceiver is transmitting or the squelch is closed.

### 3-1-14 SQUELCH CIRCUIT (MAIN A AND B UNITS)

In an FM receiver, noise signals are output from the speaker when no signal is received and are suppressed when a signal is received. The noise squelch circuit cuts off the noise signals as a result of this phenomenon.

A part of the VHF AF signals from IC4 (MAIN A UNIT) and the UHF AF signals from IC5 (MAIN B UNIT) pass through the analog switch in IC9. Then, the signal level of the main band is adjusted by the [SQL] control (R41 on the LOGIC UNIT) and the signal level of the sub band is set by R148 (fixed squelch). Then, the signals re-enter IC4 (VHF) and IC5 (UHF).

Some noise components in the VHF AF signals (20 kHz and above) are amplified at the active filter (IC4, R68, C152, C153 on the MAIN A UNIT) and are rectified at D21 for conversion to DC voltages. These voltages are sent to the CPU by Q20. Thus, while receiving no signal, the "LOW" signal is output as the "SOLSV" signal.

Some noise components in the UHF AF signals (20 kHz and above) are amplified at the active filter (IC5, R83, C124, C125 on the MAIN B UNIT) and are rectified at D17 for conversion to DC voltages. These voltages are sent to the CPU by Q19. Thus, while receiving no signal, the "LOW" signal is output as the "SOLSU" signal.

## 3-2 TRANSMITTER CIRCUIT

### 3-2-1 MICROPHONE AMPLIFIER CIRCUIT (MAIN A AND MIC-AMP UNITS)

The microphone amplifier circuit amplifies audio signals with 6 dB/oct. pre-emphasis from the microphone to a level needed for the modulation circuit. The microphone amplifier circuit is commonly used for both VHF and UHF bands.

The AF signals from the microphone pass through the mute switch circuit (Q16) and are amplified at the microphone amplifier circuit (Q1, IC1a on the MIC-AMP UNIT). IC1a includes a low level amplifier with pre-emphasis and a limiter amplifier. The amplified signals from IC1a pass through a low-pass filter (IC1b), and are then applied to each band's VCO circuit.

### 3-2-2 VHF MODULATION CIRCUIT (V-VCO UNIT)

The modulation circuit modulates the VCO oscillating signal (RF signal) using the microphone audio signals.

The audio signals from the MIC-AMP UNIT (MODV signal) change the reactance of varactor diodes (D1, D2) to modulate the oscillated signal at V-VCO (Q1). The oscillated signal is buffer-amplified at Q2 and is then applied to the drive amplifier circuit.

### 3-2-3 VHF DRIVE AMPLIFIER CIRCUIT (MAIN A UNIT)

The VHF VCO output is buffer-amplified at Q10, and is applied to the transmit/receive switching circuit (D3).

After passing through the transmit/receive switching circuit (D3), the VCO output is amplified at the drive amplifier (Q12) where 200 mW (IC-3220H: 400 mW) is obtained.

### 3-2-4 VHF POWER AMPLIFIER CIRCUIT (MAIN A UNIT)

IC5 is a power module which provides a stable 25 W (IC-3220H: 45 W) of output power.

An RF signal from the drive amplifier (Q12) is applied to IC5 (pin 4). The amplified signal is output from IC5 (pin 1), and is applied to the antenna connector through the antenna switching diode (D7) and low-pass filter circuit (C70~C72, L10~L12).

### 3-2-5 VHF APC CIRCUIT (APC-A UNIT)

To obtain stable RF output power, the APC circuit controls a current of the power module's first stage and a current of the VHF driver amplifier.

The "VRFDET" voltage, generated in the APC detector circuit (D5~D8, L8, R44~R47, C66~C67) on the MAIN A UNIT, is applied to the APC amplifiers (IC1a and IC1b) on the APC A UNIT. The amplified voltage from IC1b is applied to Q1. IC1a is an RF meter amplifier.

The output voltage from Q1, "VPOCNT," is applied to Q13 to control the RF output power.

### 3-2-6 VHF POWER CONTROL CIRCUIT (MAIN A UNIT)

The power output control circuit (Q14, Q15, R34~R37, R40) selects 1 of 3 output power steps: HIGH, LOW-2 or LOW-1, controlling the output voltage from the APC circuit by "VPOSET" voltage.

When HIGH output power is selected, Q14 and Q15 are turned OFF and "VPOSET" voltage is determined by R34~R36 and can be adjusted with R35.

When LOW-2 output power is selected, Q14 is turned ON and VPOSET voltage is decreased by connecting R37.

When LOW-1 output power is selected, Q15 is turned ON and VPOSET voltage is decreased by connecting R40.

### 3-2-7 VHF ANTENNA SWITCHING CIRCUIT (MAIN A UNIT)

When transmitting, D7, D19 and D20 are turned ON. The RF output signal from IC5 is not applied to the receiver circuit. The signal passes through L8, C68, D7, and a low-pass filter (L10~L12, C70~C72). Then, the signal is output via an antenna connector. The low-pass filter suppresses high harmonic components.

### 3-2-8 UHF MODULATION CIRCUIT (U-PLL UNIT)

The audio signals from the MIC-AMP UNIT (MODU signal) pass through the IC switch (IC9), and are applied to the varactor diodes (D1, D2) to modulate the oscillated signals at Q3. The oscillated signals are buffer-amplified at Q4 and then applied to the drive amplifier circuit.

### 3-2-9 UHF DRIVE AMPLIFIER CIRCUIT (MAIN B UNIT)

The U-PLL output is buffer-amplified at Q6, and is applied to the transmit/receive switching circuit (D2, D3), then it is amplified at the predriver (Q9) and the drive amplifier (Q10). Q10 is controlled by a collector current from Q11.

### 3-2-10 UHF POWER AMPLIFIER CIRCUIT (MAIN B UNIT)

IC1 is a power module which provides a stable 25 W (IC-3220H: 35 W) of output power.

An RF signal from the drive amplifier (Q10) is applied to IC1 (pin 1). The amplified signal is output from IC1 (pin 5), and is applied to the antenna connector through the antenna switching diode, low-pass filter and high-pass filter circuits.

### 3-2-11 UHF APC CIRCUIT (APC-B UNIT)

The "URFDET" voltage, generated in the APC detector circuit (D6~D7, L8, R38, R40, R42, R43, C57, C60) on the MAIN B UNIT, is applied to the APC amplifiers (IC1a and IC1b) on the APC B UNIT. The amplified voltage from IC1b is applied to Q1. IC1a is an RF meter amplifier.

The output voltage, "UPOCNT," from Q1 is applied to Q11 to control the RF output power.

### 3-2-12 UHF POWER OUTPUT CONTROL CIRCUIT (MAIN B UNIT)

The power output control circuit (Q12, Q13, R45~R49) selects 1 of 3 output power levels (HIGH, LOW-2, or LOW-1) and controls output voltage from the APC circuit by UPOSET voltage.

### 3-2-13 UHF ANTENNA SWITCHING CIRCUIT (MAIN A UNIT)

When transmitting, D8, D13 and D14 are ON. The RF output signal from IC1 is not applied to the receiver circuit. The signal passes through L8, C61, D8, and a low-pass filter (L10, L11, C66~C68). Then, the signal passes through a high-pass filter (L12, L13, C69~C71), and is output via an antenna connector.

## • TRANSMITTER CIRCUITS

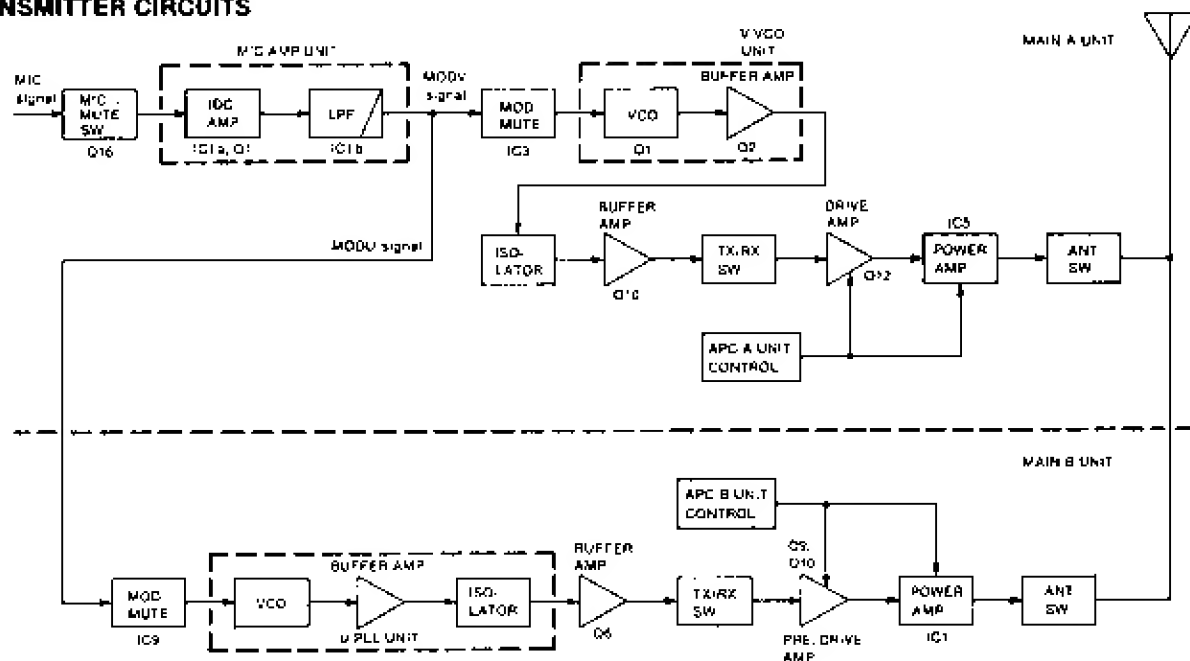


Fig. 3

### 3.3 PLL CIRCUITS

### 3-3-1 GENERAL

A PLL circuit steadily oscillates the transmit frequency and the receiver 1st LO frequency. The PLL circuit compares phases of the divided VCO frequency and reference frequency. The PLL output frequency is controlled by the divided ratio (N-data) of a programmed divider.

### 3-3-2 REFERENCE OSCILLATOR CIRCUIT (MAIN B UNIT)

A reference frequency is produced by Q1 and X1. The frequency is adjusted by C3. The reference frequency is applied to both the VHF and UHF PLL circuits.

### 3-3-3 VHF VCO CIRCUIT (V-VCO UNIT)

The VHF VCO circuit forms a Hartley oscillator circuit (Q1). Varactor diodes (D1, D2) provide frequency control. The buffer amplifier (Q2) is unaffected by VCO oscillation.

The output signal from the VCO circuit is applied to the isolator (L1). The isolator divides the signal and sends it as feedback to the PLL IC and to the buffer amplifier for the transmitter and receiver circuits.

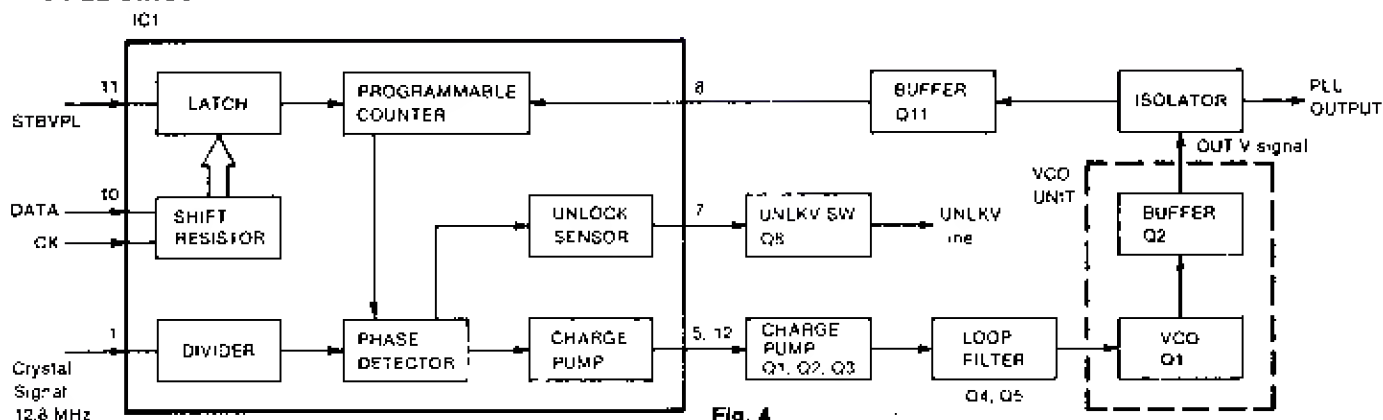
### 3-3-4 VHF PROGRAMMABLE DIVIDER AND PHASE DETECTOR CIRCUITS (V-PLL UNIT)

The programmable divider shifts the dividing ratio with a prescaler depending on the operating frequency and determines the VCO oscillating frequency.

The phase detector circuit detects the off-phase components of the VCO frequency using a stable reference frequency.

IC1 is a one-chip PLL IC that contains a two-modulus prescaler, a swallow counter, a programmable divider and a phase detector. IC1 accepts up to 200 MHz input. The VCO oscillated signal is buffer-amplified at Q11 and is then applied to the PLL IC (IC1, pin 8).

- V-PLL CIRCUIT



**Fig. 4**

In IC1, the entered signal is divided at a prescaler and at programmable divider sections. A reference frequency is also divided at a divider section. Both of the divided signals are compared at a phase-detector section to output their differential components.

### 3-3-5 VHF CHARGE PUMP AND LOOP FILTER CIRCUITS (V-PLL UNIT)

A loop filter (Q4, Q5) converts the phase-detected signal (pulse signal) to DC voltage (PLL lock voltage) to control the VCO oscillating signal. A charge pump (Q1—Q3) is used to expand the range of PLL lock voltage. The PLL lock voltage changes the reactance of a varactor diode in the VCO circuit. The DC voltage of the PLL is also used for the receiver tuning circuit.

### 3-3-6 UHF VCO CIRCUIT (U-PLL UNIT)

The UHF VCO circuit forms a Colpitts oscillator circuit (Q3). Strip lines are used for stable oscillation over a wide frequency range. Varactor diodes (D1, D2) provide frequency control. The buffer amplifier (Q4) is unaffected by VCO oscillation.

The output signal from the VCO circuit is applied to the low-pass filter (L2, C7, C8) and sends it as feedback to the PLL IC and to the buffer amplifier for the transmitter and receiver circuits.

### 3-3-7 UHF PROGRAMMABLE DIVIDER AND PHASE DETECTOR CIRCUITS (U-PLL UNIT)

The programmable divider shifts the dividing ratio with a prescaler depending on the operating frequency, and determines the VCO oscillating frequency.

The phase detector circuit detects the off-phase components of the VCO frequency using a stable reference frequency.

IC1 is a one-chip PLL IC that contains a two-modulus prescaler, a swallow counter, a programmable divider and a phase detector. The VCO oscillated signal is applied to the PLL IC (IC1, pin 1).

### 3-4-3 CPU PORT ALLOCATIONS (LOGIC UNIT)

#### • IC4 CPU

PORT No.	PIN No.	TERMINAL NAME	DESCRIPTION
D2	50	S TONE	Outputs a signal for 88.5 Hz tone.
D3	51	BEEP	Outputs a signal for beep tone.
R01~ R03	1~3	KEYS0~ KEYS2	Output a strobe signal for the initial matrix.
R10~ R13	4~7	KEY10~ KEY13	Input ports for the initial matrix.
R20~ R23	8~11	SRFO0~ SRFO3	Outputs a counting signal for the S-indicator.
R30	14	DIAL UP	Input ports for the up signal of the main dial.
R31	15	DIAL DN	Input ports for the down signal of the main dial.
R32	16	INT0/ DIAL CK	Input port for the main dial up/down clock.
R33	17	INT1/ BACKUP	Input port for the signal of memory backup.
R40	27	SCK	Outputs clock signals for the serial data (SO).
R41	28	SI	Inputs serial data.
R42	29	SO	Outputs serial data.
R43	30	P/S	Outputs a strobe signal for the data expander (IC14 on the MAIN A UNIT).
R50	18	SQLS V	Detects a VHF squelch signal. When the signal is "HIGH," the VHF squelch opens.
R51	19	SQLS U	Detects a UHF squelch signal. When the signal is "HIGH," the UHF squelch opens.
R52	20	UNLK V	Detects a VHF PLL unlock signal. When the signal is "HIGH," the VHF PLL is unlocked. Normally, the port is "LOW."
R53	21	UNLK U	Detects a UHF PLL unlock signal. When the signal is "HIGH," the UHF PLL is unlocked. Normally, the port is "LOW."
R60~ R62	22~24	SEL A~ SEL C	Output signals for controlling the STB selector (IC13 on the MAIN A UNIT).
R63	25	CE (LCD)	Outputs a signal for LCD driver selection.
R70	31	MIC U/D	Input port for the microphone up/down signal.
R71	32	MIC CK	Input port for the microphone clock.
R72	33	MW (SW)	This port becomes low when the [MW] switch is pushed.
R73 (SW)	34	MONI	This port becomes low when the [MONI] switch is pushed.
R80 (SW)	35	SET	This port becomes low when the [SET] switch is pushed.
R81 (SW)	36	HI/LOW	This port becomes low when the [HI/LOW] switch is pushed.
R82 (SW)	37	PGR/CS	This port becomes low when the [PGR/CS] switch is pushed.
R83 (SW)	38	T/TSQL	This port becomes low when the [T/TSQL] switch is pushed.

PORT No.	PIN No.	TERMINAL NAME	DESCRIPTION
R90 (SW)	39	DUP	This port becomes low when the [DUP] switch is pushed.
R91 (SW)	40	BAND	This port becomes low when the [BAND] switch is pushed.
R92 (SW)	41	M/CALL	This port becomes low when the [M/CALL] switch is pushed.
R93 (SW)	42	V/M	This port becomes low when the [V/M] switch is pushed.
RA0	12	SRFI	Inputs a resulting signal from the meter comparator.
RA1	13	PTT	Inputs a signal on the PTT line. This port becomes "HIGH" when the PTT switch is pushed.
RESET	43	RESET INPUT	When a "HIGH" signal is applied here, the CPU either is initialized or changes to standby mode.
OSC1	45		Input port for the oscillator of the CPU clock.
OSC2	46		Output port for the oscillator of the CPU clock.
GND	47		Ground.
VCC	26		Input port for the power source of the CPU.

### 3-4-4 I/O EXPANDER IC PORT ALLOCATIONS

#### • IC13 STB SELECTOR (MAIN A UNIT)

PORT No.	PIN No.	TERMINAL NAME	DESCRIPTION
Q0	3	STBPLV	Outputs a strobe for VHF PLL data.
Q1	14	STBPLU	Outputs a strobe for UHF PLL data.
Q2	2	STBVC	Outputs a strobe for VHF control.
Q3	15	STBUC	Outputs a strobe for UHF control.
Q4	1	STBCC	Outputs a strobe for common control.
Q5	6	STBOT	Outputs a strobe for an optional UT-50 TONE SQUELCH UNIT control.
Q6	7	STBOD	Outputs a strobe for an optional UT-55 DTMF ENCODER/DECODER UNIT control.

#### • IC1 SHIFT REGISTER (MAIN A UNIT)

PORT No.	PIN No.	TERMINAL NAME	DESCRIPTION												
Q1	4	VVCO	Becomes "HIGH" when the VHF band is selected.												
Q2	5	VTX	Becomes "HIGH" while transmitting on the VHF band.												
Q3~ Q4	6~7	VLP1~ VLP2	For setting VHF RF output power. <table border="1"> <tr> <td>Power</td><td>High</td><td>Low1</td><td>Low2</td></tr> <tr> <td>VLP1</td><td>L</td><td>H</td><td>L</td></tr> <tr> <td>VLP2</td><td>L</td><td>L</td><td>H</td></tr> </table>	Power	High	Low1	Low2	VLP1	L	H	L	VLP2	L	L	H
Power	High	Low1	Low2												
VLP1	L	H	L												
VLP2	L	L	H												
Q7	12	MODE	Becomes "HIGH" when receiving FM mode.												
Q8	11	YACT	Becomes "HIGH" when VHF is main band.												



In IC1, the entered signal is divided at a prescaler and at programmable divider sections. A reference frequency is also divided at a divider section. Both of the divided signals are compared at a phase-detector section to output their differential components.

#### • U-PLL CIRCUIT

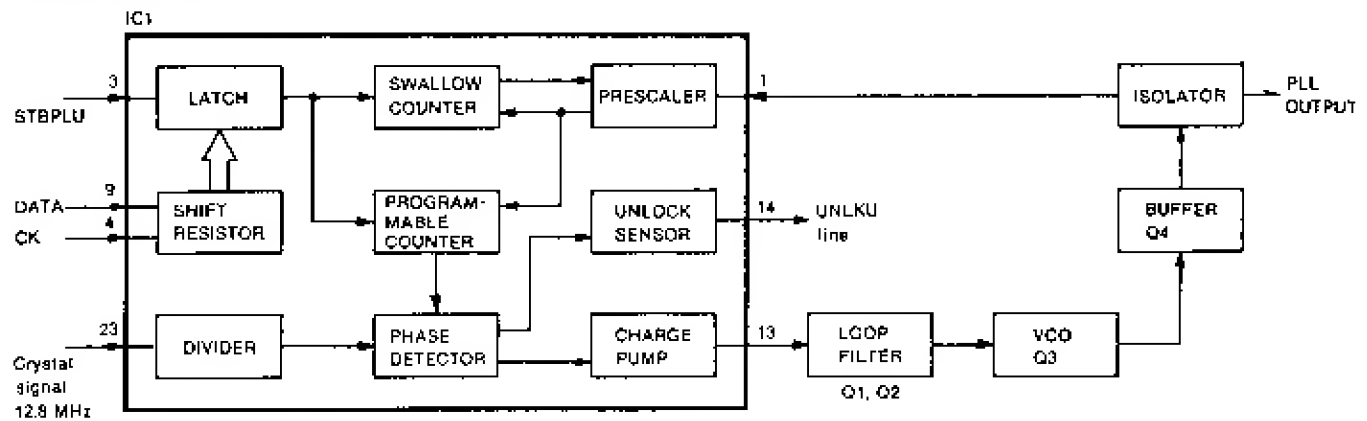


Fig. 5

### 3-4 LOGIC CIRCUITS

#### 3-4-1 S/RF INDICATOR CIRCUIT (LOGIC UNIT)

The S-indicator signal coming from the MAIN A UNIT is applied to the meter comparator (IC3, pin 5). IC3 (pin 6) receives a counting signal from the CPU (IC4, pins 8 ~11).

IC3 (pin 7) becomes "HIGH" when the the counting signal is lower than the S-indicator signal and becomes "LOW" when the counting signal is higher than the S-indicator signal.

When the IC3 (pin 7) becomes "LOW," the CPU detects that the signal strength level is the same as the counting signal level, and displays the counting signal on the LCD.

When transmitting, the LCD displays the selected RF output power level regardless of the input signal strength.

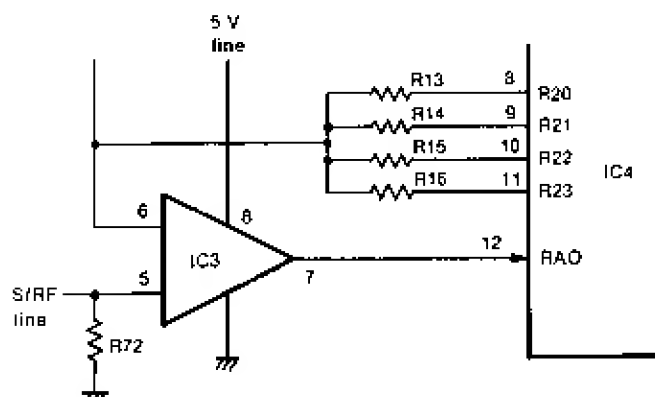


Fig. 6

#### 3-3-8 UHF CHARGE PUMP AND LOOP FILTER CIRCUITS (U-PLL UNIT)

An active loop filter (Q1, Q2) converts the phase-detected signal (pulse signal) to DC voltage (PLL lock voltage) to control the VCO oscillating signal. The PLL lock voltage changes the reactance of a varactor diode in the VCO circuit.

#### 3-4-2 CPU RESET CIRCUIT (LOGIC UNIT)

IC2 detects voltage on the 5 V line. When the 5 V line becomes higher than the threshold voltage of IC2, the CPU reset circuit outputs "HIGH" as the interrupt signal.

While holding the [SET] and [MW] switches, and turning ON the power, the reset port of the CPU (IC4, pin 43) becomes "HIGH". When the port receives "HIGH," the CPU is initialized.

When the 5 V line becomes lower than the threshold voltage of IC2, the INT1 port of the CPU (pin 17) becomes "LOW", and the CPU enters the standby condition.

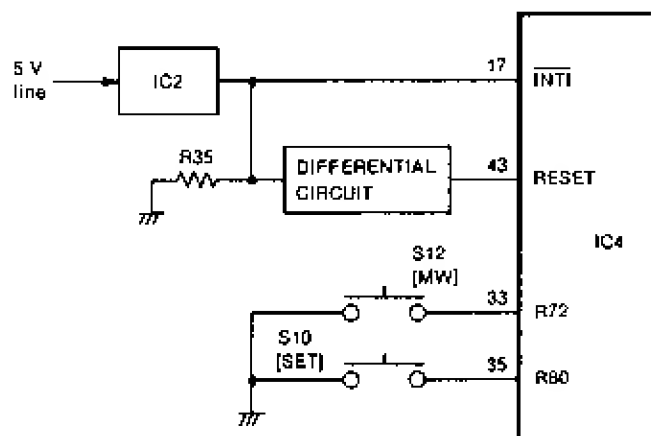


Fig. 7



### • IC3 SHIFT REGISTER (MAIN B UNIT)

PORT No.	PIN No.	TERMINAL NAME	DESCRIPTION												
Q1	4	UVCO	Becomes "HIGH" when the UHF band is selected.												
Q2	5	UTX	Becomes "HIGH" while transmitting on the UHF band.												
Q3~Q4	6~7	ULP1~ULP2	For setting UHF RF output power. <table border="1"> <tr> <td>Power</td><td>High</td><td>Low1</td><td>Low2</td></tr> <tr> <td>ULP1</td><td>L</td><td>H</td><td>L</td></tr> <tr> <td>ULP2</td><td>L</td><td>L</td><td>H</td></tr> </table>	Power	High	Low1	Low2	ULP1	L	H	L	ULP2	L	L	H
Power	High	Low1	Low2												
ULP1	L	H	L												
ULP2	L	L	H												
Q8	11	UACT	Becomes "HIGH" when UHF is main band.												

### • IC11 SHIFT REGISTER (MAIN A UNIT)

PORT No.	PIN No.	TERMINAL NAME	DESCRIPTION															
Q1~Q2	4~5	DM1~DM2	For setting the LCD dimmer. (Level 3 is brightest.) <table><tr><td>Level</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>DM1</td><td>L</td><td>H</td><td>L</td><td>H</td></tr><tr><td>DM2</td><td>L</td><td>L</td><td>H</td><td>H</td></tr></table>	Level	0	1	2	3	DM1	L	H	L	H	DM2	L	L	H	H
Level	0	1	2	3														
DM1	L	H	L	H														
DM2	L	L	H	H														
Q3	6	BAND	Becomes "HIGH" when VHF is main band. Becomes "LOW" when UHF is main band.															
Q5	14	OPTS	Becomes "HIGH" when VHF is connected to an optional unit. Becomes "LOW" when UHF is connected to an optional unit.															
Q6	13	AF MUTE	Becomes "HIGH" when AF amplifier input is muted.															
Q7	12	MIC MUTE	Becomes "HIGH" when MIC amplifier input is muted.															

### • IC8 SHIFT REGISTER (MAIN A UNIT)

PORT No.	PIN No.	TERMINAL NAME	DESCRIPTION
Q1	4	UMUTE1	Becomes "HIGH" when DETU signal is completely muted.
Q2	5	UMUTE2	Becomes "HIGH" when DETU signal is attenuated at level 3.
Q3	6	UMUTE3	Becomes "HIGH" when DETU signal is attenuated at level 2.
Q4	7	UMUTE4	Becomes "HIGH" when DETU signal is attenuated at level 1.
Q5	14	VMUTE1	Becomes "HIGH" when DETV signal is completely muted.
Q6	13	VMUTE2	Becomes "HIGH" when DETV signal is attenuated at level 3.
Q7	12	VMUTE3	Becomes "HIGH" when DETV signal is attenuated at level 2.
Q8	11	VMUTE4	Becomes "HIGH" when DETV signal is attenuated at level 1.

### • IC14 P/S SHIFT REGISTER (MAIN A UNIT)

PORT No.	PIN No.	TERMINAL NAME	DESCRIPTION
QA	4	TSQLS	Becomes "HIGH" when an optional tone squelch is open.
QB	5	UNIT. T	Becomes "LOW" when an optional UT-50 TONE SQUELCH UNIT is connected.
QC	6	UNIT. D	Becomes "LOW" when an optional UT-55 DTMF ENCODER/DECODER UNIT is connected.
QD	7	STD	Becomes "HIGH" while DTMF is decoding
QE	13	D0	DTMF decode data (4 bits)
QF	14	D1	
QG	15	D2	
QH	1	D3	

## 3-5 OTHER CIRCUITS

### 3-5-1 REGULATOR CIRCUIT (MAIN B UNIT)

IC8 is a 3-terminal voltage regulator IC chip. +13.8 V is applied to the input terminal. The output terminal outputs a regulated +9 V (8 V line) to each unit.

Q26, Q27 and D19 produce a regulated 8 V (V8V line) for the MAIN A UNIT. These 8 V are separated from the 8 V line.

IC7 is a 3-terminal voltage regulator IC chip. +13.8 V is applied to an input terminal and the output terminal outputs +5.5 V (5 V line) using D21.

### 3-5-2 DC-DC CONVERTER (MAIN B UNIT)

A DC-DC converter consisting of IC6, Q28 and Q29 produces approximately 30 V DC from 8 V DC to obtain wide range lock voltage for the PLL circuits.

### 3-5-3 CPU POWER SUPPLY CIRCUIT (LOGIC UNIT)

When the power switch is turned OFF, voltage is applied to the CPU (IC4, pin 26) via D11 from the lithium backup battery installed on the LOGIC UNIT to provide backup power for the memory contents.

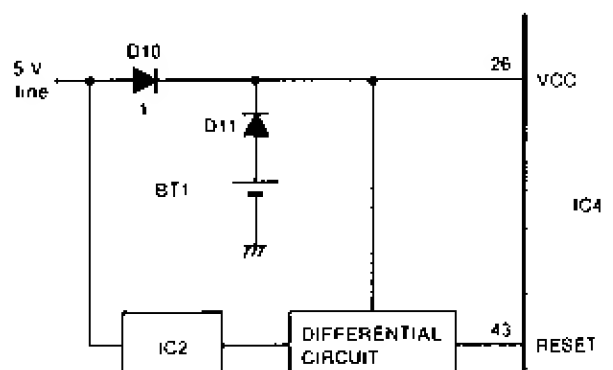


Fig. 8

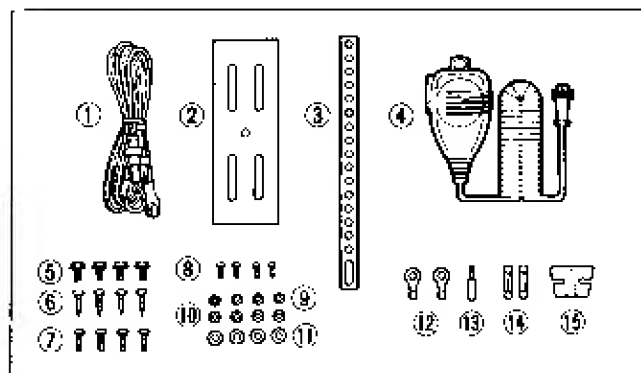
## SECTION 4 MECHANICAL PARTS AND DISASSEMBLY

### • FRONT, MAIN A AND MAIN B PARTS

LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.	LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
(1)	8210005610	Front panel (A) (incl. window panel) IC-3220A	1	(26)	8810003660	Icom screw A5	1
	8210005620	Front panel (B) (incl. window panel) IC-3220E	1	(27)	8450000140	Connector HSJ0807-01-010 [EXT SP]	1
	8210005630	Front panel (C) (incl. window panel) IC-3220H	1	(28)	8510001010	#99 VCO case	1
(2)	8610006490	Knob N153 [VOL], [SQL]	2	(29)	8010009960	834 chassis	1
(3)	8610006500	Knob N154 [MAIN DIAL]	1	(30)	8510008420	V-PA shield	1
(4)	8930017690	LCD rubber	1	(31)	8510006450	LOGIC shield	1
(5)	8930012430	543 MIC spacer	1	(32)	8810000260	Screw PH M3 x 12	3
(6)	8930017500	LCD filter	1	(33)	8810003160	Set screw A M3 x 6	9
(7)	8930017760	LCD holder	1	(34)	8810008010	Screw FH M3 x 5 ZK BS	8
(8)	8010009740	Reflector	1	(35)	8810002160	Screw FH M3 x 5	6
(9)	8930017720	LCD film filter	1	(36)	8810001910	Screw PH M3 x 6 NI BS	2
(10)	8310019361	Switch sheet-1	1	(37)	8810002560	Screw BuH M2 x 4 NI BS	1
(11)	8610006520	Button K150 [V/MHz], [M/CALL], etc	8	(38)	8930018780	Shield plate BT	2
(12)	8610006530	Button K151 [POWER]	1	(39)	8110003840	Top cover	1
(13)	8610006510	Button K152 [MW], [MONI]	2	(40)	8930017810	833 SP plate	1
(14)	8930017770	Switch sponge	1	(41)	2510000470	Speaker EAS-6P100SA	1
(15)	8930018340	Switch sponge (A)	1	(42)	8930017630	50 speaker net	1
(16)	8930018350	Switch sponge (B)	1	(43)	8810006230	Screw OH M2.6 x 4 ZK	4
(17)	5030000560	LCD LD-BU9496E [FUNCTION DISPLAY]	1	(44)	8110003850	Bottom cover	1
(18)	2250000050	Encoder EVQ-WDGF15 24B [MAIN DIAL]	1	(45)	8930017790	U module plate	1
(19)	2230000550	Switch SPPH23079A [POWER]	1	(46)	8810003660	Icom screw A5	1
(20)	2260000580	Switch SKHLAD035A [V/MHz], [M/CALL], etc.	10	(47)	8510006411	833 VCO case-1	1
(21)	8930017730	LCD contact strip SRCN-833-W	1	(48)	8510006430	U-PA shield	1
(22)	8510000290	Connector BS-S-E [MICROPHONE]	1	(49)	8510006440	Antenna cover	2
(23)	7210001870	Variable resistor EVU-F2AF20A14 (10KA) [VOL]	1	(50)	8810003160	Set screw A M3 x 6	10
(24)	7210001860	Variable resistor EVU-F2AF20B14 (10KB) [SQL]	1	(51)	8810002160	Screw FH M3 x 5	2
(25)	8930017780	V module plate	1	(52)	8810001910	Screw PH M3 x 6 NI BS	4
				(53)	8900002700	Cable OPC-249 [POWER RECEPTACLE]	1
				(54)	8900002450	Cable OPC-223 [ANTENNA CONNECTOR]	1
				(55)	6510007850	Pin LLM61T-2.0 (incl. 55)	2

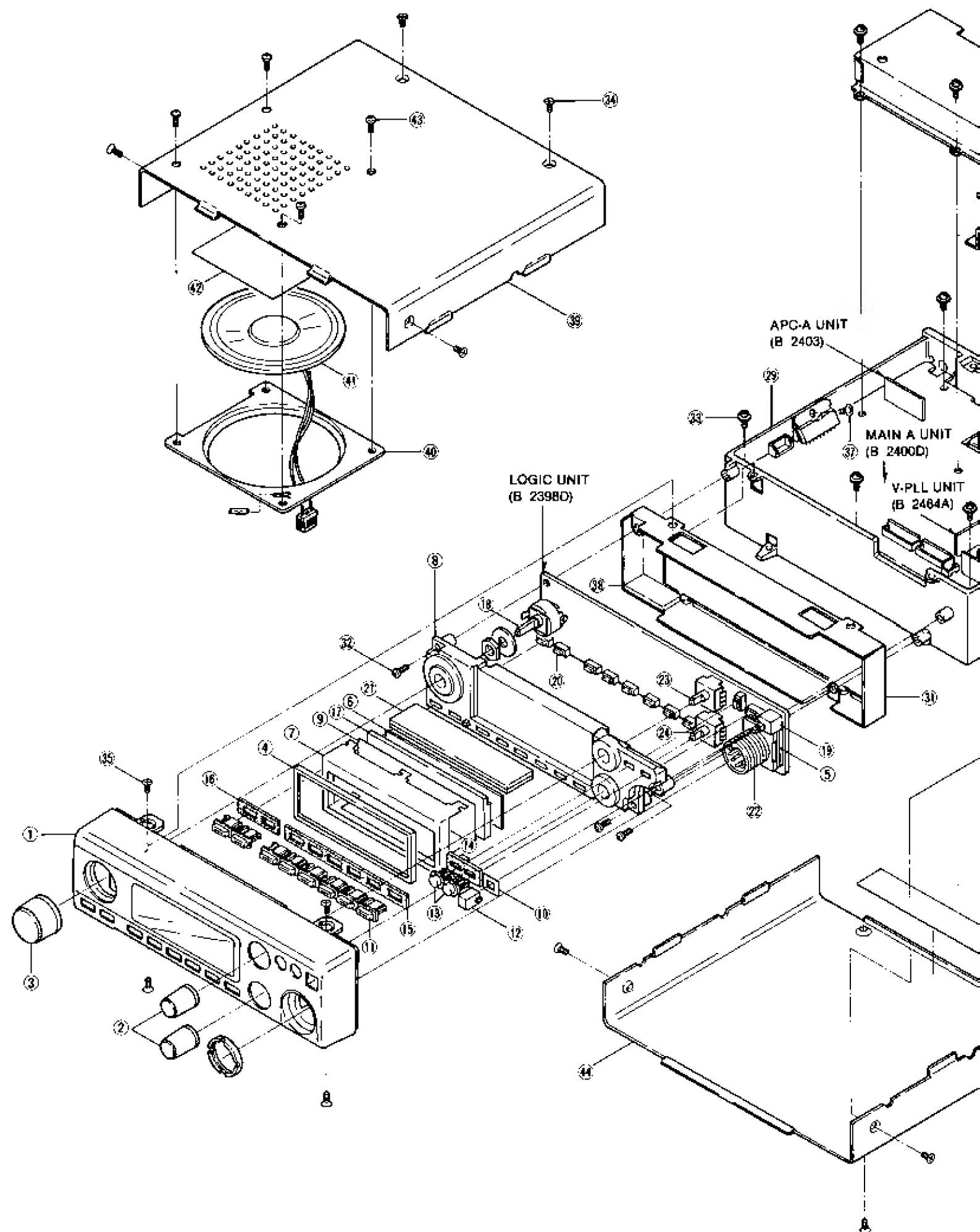
**Screw abbreviations** FH: Flat head PH: Pan head BuH: Button head OH: Oval countersunk head ZK: Black  
BS: Brass NI: Nickel

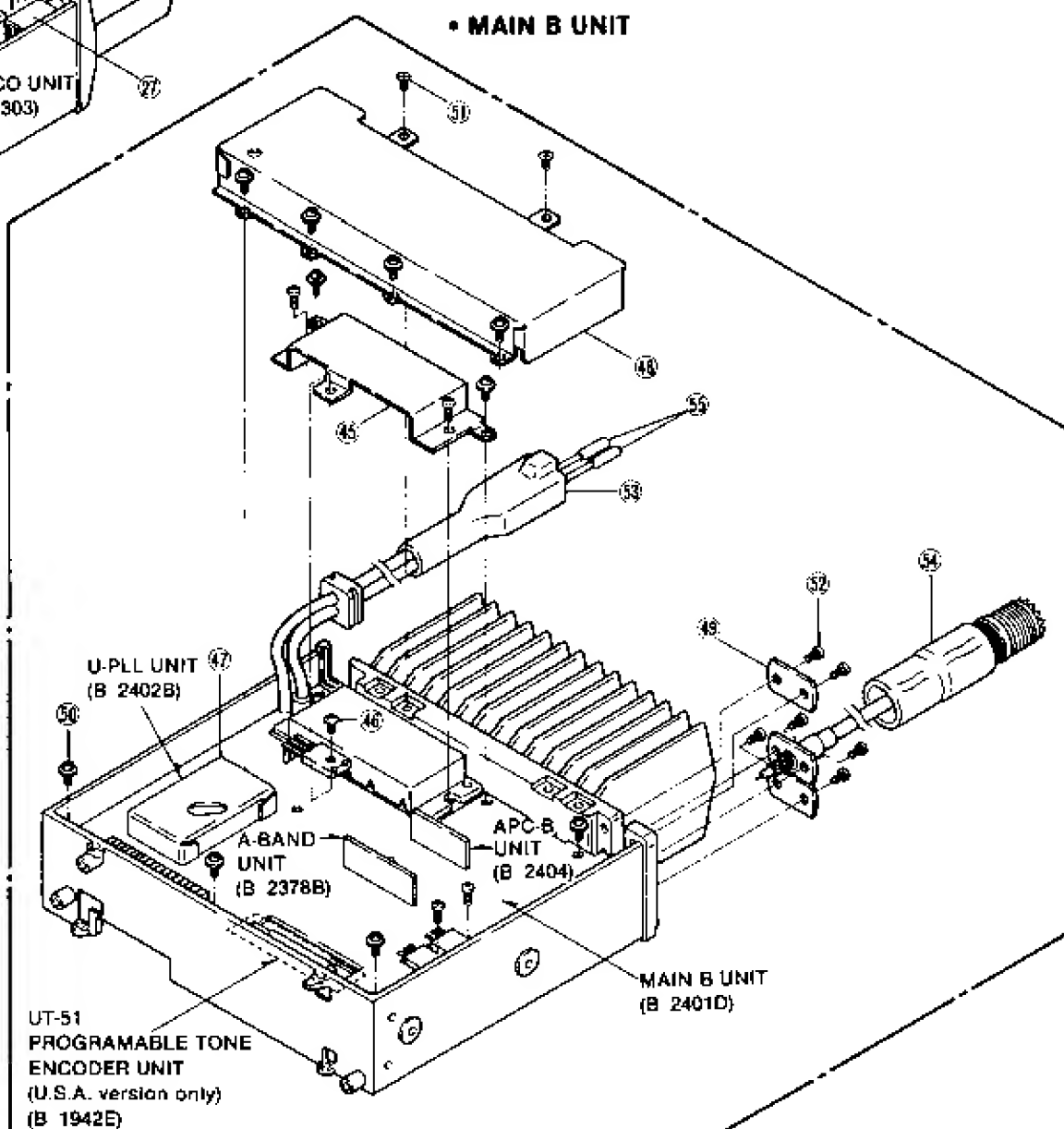
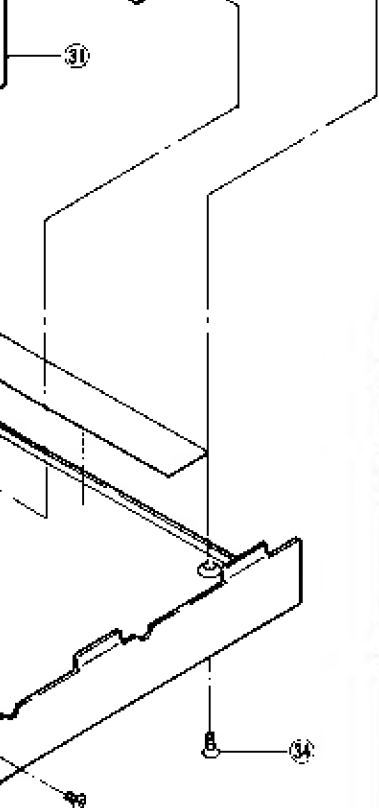
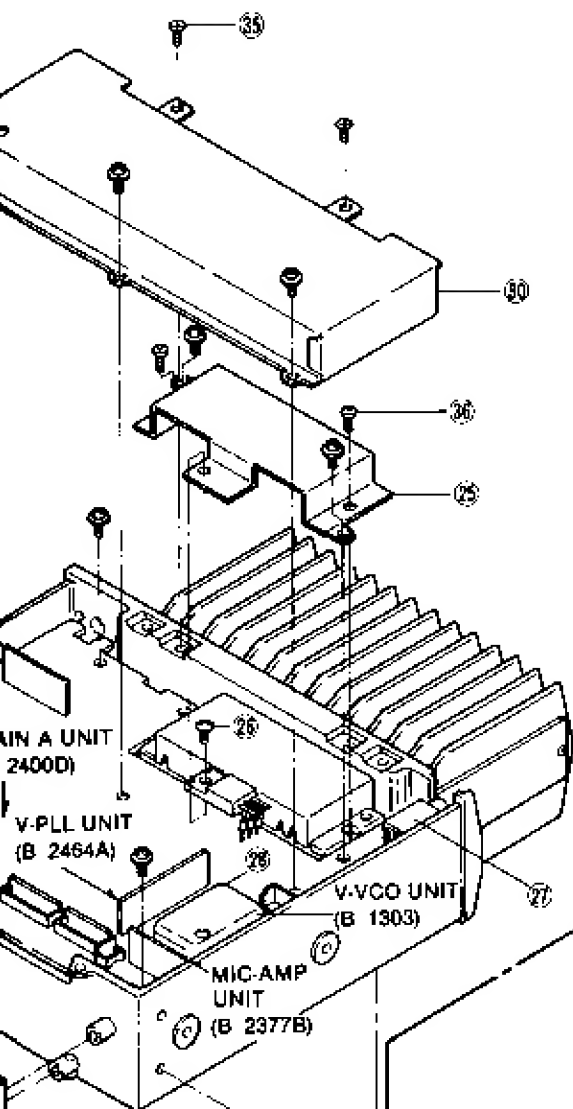
### • ACCESSORIES



LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
(1)	Optional product	DC power cable OPC-044 B	1
(2)	8010005180	Mounting bracket	1
(3)	8010004060	Mounting support bracket (B) ZK	1
(4)	Optional product	Microphone HM-58 IC-3220A (AUS), IC-3220H (AUS-H) Microphone HM-56 IC-3220A (USA, SEA), IC-3220H (USA-H, SEA-H) Microphone HM-59 IC-3220E (EUR, ITA), IC-3220H (EUR-H, ITA-H)	1
(5)	8820000530	Mounting bolt	4
(6)	8810000950	Screw PH A M5 x 16	4
(7)	8810000470	Screw PH M5 x 12	4
(8)	8810003860	Set screw A M4 x 8	4
(9)	8830000120	Nut M5	4
(10)	8850000440	Spring washer M5 NI	4
(11)	8850000150	Flat washer M5 NI BS	4
(12)	8510003070	Cable plug R5.5-B	2
(13)	8610000020	AP313 3.5φ CS plug	1
(14)	5210000120	Fuse FGB 15A	2
(15)	8930007300	Microphone hanger	1

**Screw abbreviations** PH: Pan head BS: Brass NI: Nickel  
ZK: Black





# SECTION 5 PARTS LIST

## [LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
IC1	1130004190	IC LC7582A
IC2	1110001500	IC S-8054ALR-LN-T1
IC3	112000430	IC LA6393M-TP-T1
IC4	1140001470	IC HD404019A37FS
IC5	1130003920	IC TC4589F (TE85R)
Q1	1590000410	Transistor RN2404 (TE85R)
Q2	1530000160	Transistor 2SC2712-Y (TE85RTEM)
Q3	1510000110	Transistor 2SA1162-Y (TE85R)
Q4	1530000160	Transistor 2SC2712-Y (TE85RTEM)
Q5	1530000160	Transistor 2SC2712-Y (TE85RTEM)
Q6	1530000160	Transistor 2SC2712-Y (TE85RTEM)
Q7	1530001950	Transistor 2SC2712-GR (TE85R)
D1	1750000040	Diode 1SS190 (TE85R) (AUS), (AUS-H)
D1	1750000030	Diode 1SS187 (TE85R) (EUR), (EUR-H), (USA), (USA-H)
D1	1750000010	Diode 1SS181 (TE85R) (SEA), (SEA-H)
D2	1750000030	Diode 1SS187 (TE85R) (EUR), (EUR-H)
D2	1750000040	Diode 1SS190 (TE85R) (ITA), (ITA-H)
D3	1710000600	Diode 1SS254
D4	1710000600	Diode 1SS254
D5	1710000600	Diode 1SS254
D6	1710000600	Diode 1SS254 (EUR), (EUR-H), (AUS), (AUS-H)
D7	1710000600	Diode 1SS254
D8	1750000050	Diode 1SS193 (TE85R) (EUR), (EUR-H), (AUS), (AUS-H)
D9	1750000010	Diode 1SS181 (TE85R) (ITA), (ITA-H)
D9	1750000030	Diode 1SS187 (TE85R) (USA), (USA-H)
D10	1750000010	Diode 1SS181 (TE85R)
D11	1750000050	Diode 1SS193 (TE85R)
D12	1750000050	Diode 1SS193 (TE85R)
D13	1730000840	Zener RD9.1M-T2B2
D14	1750000050	Diode 1SS193 (TE85R)
X1	6060000230	Crystal FAR-C4CA-04194000 -M01
R1	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R2	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R3	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R4	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R5	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R6	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R7	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R8	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R9	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R10	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R11	7030003600	Resistor ERJ3GEYJ 223 V (22 kΩ)
R12	7030003520	Resistor ERJ3GEYJ 472 V (4.7 kΩ)
R13	7030003760	Resistor ERJ3GEYJ 474 V (470 kΩ)
R14	7030003720	Resistor ERJ3GEYJ 224 V (220 kΩ)
R15	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R16	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R17	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R18	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)

## [LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
R19	7030003600	Resistor ERJ3GEYJ 223 V (22 kΩ)
R20	7030003600	Resistor ERJ3GEYJ 223 V (22 kΩ)
R21	7030003800	Resistor ERJ3GEYJ 105 V (1 MΩ)
R22	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R23	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R24	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R25	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R26	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R27	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R28	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R29	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R30	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R31	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R32	7030003650	Resistor ERJ3GEYJ 563 V (56 kΩ)
R33	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R34	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R35	7030003720	Resistor ERJ3GEYJ 224 V (220 kΩ)
R36	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R37	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R38	7030003440	Resistor ERJ3GEYJ 102 V (1 kΩ)
R39	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R40	7210001870	Variable Resistor EVU-F2AF20A14 (10KA) [VOL]
R41	7210001860	Variable Resistor EVU-F2AF20B14 (10KB) [SQL]
R43	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R44	7030003520	Resistor ERJ3GEYJ 472 V (4.7 kΩ)
R45	7030003520	Resistor ERJ3GEYJ 472 V (4.7 kΩ)
R46	7030003520	Resistor ERJ3GEYJ 472 V (4.7 kΩ)
R47	7030003520	Resistor ERJ3GEYJ 472 V (4.7 kΩ)
R48	7030003520	Resistor ERJ3GEYJ 472 V (4.7 kΩ)
R49	7030003520	Resistor ERJ3GEYJ 472 V (4.7 kΩ)
R50	7030003580	Resistor ERJ3GEYJ 153 V (15 kΩ)
R51	7030003520	Resistor ERJ3GEYJ 472 V (4.7 kΩ)
R52	7030003800	Resistor ERJ3GEYJ 105 V (1 MΩ)
R53	7030003480	Resistor ERJ3GEYJ 222 V (2.2 kΩ)
R54	7030003560	Resistor ERJ3GEYJ 103 V (10 kΩ)
R55	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R56	7030003480	Resistor ERJ3GEYJ 222 V (2.2 kΩ)
R57	7030003600	Resistor ERJ3GEYJ 223 V (22 kΩ)
R58	7030003680	Resistor ERJ3GEYJ 103 V (10 kΩ)
R59	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R60	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R61	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R62	7030003440	Resistor ERJ3GEYJ 102 V (1 kΩ)
R63	7030003320	Resistor ERJ3GEYJ 101 V (100 Ω)
R64	7030003600	Resistor ERJ3GEYJ 223 V (22 kΩ)
R65	7030003640	Resistor ERJ3GEYJ 225 V (2.2 MΩ)
R66	7030003640	Resistor ERJ3GEYJ 225 V (2.2 MΩ)
R67	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R68	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R69	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R70	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R71	7030000140	Resistor MCR10EZHJ 10 Ω (100)
R72	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R74	7030003580	Resistor ERJ3GEYJ 153 V (15 kΩ)
R75	7030003350	Resistor ERJ3GEYJ 181 V (180 Ω)
R76	7030003350	Resistor ERJ3GEYJ 181 V (180 Ω)
R77	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
C1	4030006830	Ceramic C1608 SL 1H 331J- T-A
C2	4510001320	Electrolytic 8R3 MS6 47 μF
C3	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C4	4550000270	Tantalum TESVA 1E 474MH-8L
C5	4030004760	Ceramic C2012 JF 1E 104Z- T-A

# **[LOGIC UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
C6	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C7	4510001320	Electrolytic	6R3 MS5 47 $\mu$ F
C8	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C10	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C11	4030006860	Ceramic	C1608 JB 1H 102K- T-A
C12	4030006860	Ceramic	C1608 JB 1H 102K- T-A
C13	4030006860	Ceramic	C1608 JB 1H 102K- T-A
C14	4030006860	Ceramic	C1608 JB 1H 102K- T-A
C15	4030006860	Ceramic	C1608 JB 1H 102K- T-A
C16	4030006860	Ceramic	C1608 JB 1H 102K- T-A
C17	4030006860	Ceramic	C1608 JB 1H 102K- T-A
C18	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C19	4030006870	Ceramic	C1608 JB 1H 222K- T-A
C20	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C21	4030005090	Ceramic	C2012 JB 1H 223K- T-A
C22	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C23	4030006710	Ceramic	C1608 SL 1H 470J- T-A
C24	4030006710	Ceramic	C1608 SL 1H 470J- T-A
DS1	5030000560	LCD	LD-BU9496E (E-5141-4)
DS2	5080000150	Lamp	HRS-7219A
DS3	5080000150	Lamp	HRS-7219A
S1	2250000050	Encoder	EVO-WQGF15 24B [MAIN DIAL]
S2	2230000550	Switch	SPPH23079A [POWER]
S3	2260000580	Switch	SKHLAD035A [V/MHz]
S4	2260000580	Switch	SKHLAD035A [M/CALL]
S5	2260000580	Switch	SKHLAD035A [BAND]
S6	2260000580	Switch	SKHLAD035A [DUP]
S7	2260000580	Switch	SKHLAD035A [T/T, SQL]
S8	2260000580	Switch	SKHLAD035A [PRG/CB]
S9	2260000580	Switch	SKHLAD035A [HI/LO]
S10	2260000580	Switch	SKHLAD035A [SET]
S11	2260000580	Switch	SKHLAD035A [MONI]
S12	2260000580	Switch	SKHLAD035A [MW]
BT1	3020000020	Lithium Battery	BR2032-1T2
EP1	0910025304	P.C. Board	B 2398D (LOGIC)
EP2	8930017730	LCD contact strip	SACN-833-W

# **[MAIN A UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
IC10	1130004730	IC	BU4066BF-T1
IC11	1130000830	IC	$\mu$ PD4094BG-T1
IC12	1110000890	IC	$\mu$ PC1241H
IC13	1130002370	IC	$\mu$ PD4028BG-T1
IC14	1130004870	IC	BU4021BF-T1
Q1	1590001000	Transistor	RN2427 (TE85R)
Q2	1590000460	Transistor	RN1402 (TE85R)
Q3	1590001000	Transistor	RN2427 (TE85R)
Q4	1590000460	Transistor	RN1402 (TE85R)
Q5	1590000460	Transistor	RN1402 (TE85R)
Q6	1590001000	Transistor	RN2427 (TE85R)
Q7	1530000180	Transistor	2SC2712-Y (TE85RT EM)
Q8	1510000690	Transistor	2SA1734 (TE12R)
Q9	1530002050	Transistor	2SC3661-TA
Q10	1530002030	Transistor	2SC3772-3-TA
Q11	1530002030	Transistor	2SC3772-3-TA
Q12	1530000640	Transistor	2SC2407 (A) (IC-3220A/E)
	1590000390	Transistor	MRF559 (IC-3220H)
Q13	1520000380	Transistor	2SB1143 S (IC-3220A/E)
	1520000390	Transistor	2SB1135 R (IC-3220H)
Q14	1590000420	Transistor	RN1404 (TE85R)
Q15	1590000420	Transistor	RN1404 (TE85R)
Q16	1590000380	FET	2SJ106-Y (TE85R)
Q17	1590000380	FET	2SJ106-Y (TE85R)
Q18	1590000380	FET	2SJ106-Y (TE85R)
Q19	1530002030	Transistor	2SC3772-3-TA
Q20	1530002280	Transistor	2SC4081 T107 S
Q21	1590000830	Transistor	FMG2 T149
Q22	1530002280	Transistor	2SC4081 T107 S
Q23	1530002280	Transistor	2SC4081 T107 S
Q24	1590000420	Transistor	RN1404 (TE85R)
Q25	1590000420	Transistor	RN1404 (TE85R)
Q26	1590000990	Transistor	DTC363EK T147
Q27	1590000990	Transistor	DTC363EK T147
Q28	1590000990	Transistor	DTC363EK T147
Q29	1590000990	Transistor	DTC363EK T147
Q30	1590000990	Transistor	DTC363EK T147
Q31	1590000990	Transistor	DTC363EK T147
Q32	1590000990	Transistor	DTC363EK T147
Q33	1590000990	Transistor	DTC363EK T147
Q34	1590000350	FET	3SK140-Y (TE85R)
Q35	1590000350	FET	3SK140-Y (TE85R)
Q36	1530002030	Transistor	2SC3772-3-TA
Q37	1530000180	Transistor	2SC2712-Y (TE85RTM)
Q38	1530002280	Transistor	2SC4081 T107 S
Q39	1530002280	Transistor	2SC4081 T107 S
Q42	1510000690	Transistor	2SA1734 (TE12R)
Q43	1530000180	Transistor	2SC2712-Y (TE85RTM)
Q44	1530002550	Transistor	2SC3326-B (TE85R)
Q45	1590000420	Transistor	RN1404 (TE85R)
D1	1730001060	Zener	RD20M-T2B2
D2	1750000040	Diode	1SS190 (TE85R)
D3	1790000450	Diode	MA862 (TX)
D4	1750000040	Diode	1SS190 (TE85R)
D5	1790000490	Diode	HSM88AS-TR
D6	1790000490	Diode	HSM88AS-TR
D7	1710000290	Diode	MI308 (IC-3220A/E)
	1710000310	Diode	MI407 (IC-3220H)
D8	1750000020	Diode	1SS184 (TE85R)
D9	1750000020	Diode	1SS184 (TE85R)
D10	1730000730	Zener	RD6.2M-T2B2
D11	1790000490	Diode	HSM88AS-TR
D12	1790000450	Diode	MA862 (TX)
D13	1720000050	Varicap	1SV50E
D14	1720000050	Varicap	1SV50E
D15	1720000050	Varicap	1SV50E
D17	1720000050	Varicap	1SV50E

# **[MAIN A UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1130000830	IC	$\mu$ PD4094BG-T1
IC2	1130004200	IC	TC4S68F (TE85R)
IC3	1130004200	IC	TC4S68F (TE85R)
IC4	1120001850	IC	TK10487MTA
IC5	1150000920	IC	SC1124 (IC-3220A/E)
	1150000910	IC	SC1125 (IC-3220H)
IC6	1110000960	IC	NJM4558M (T1)
IC7	1110000960	IC	NJM4558M (T1)
IC8	1130000830	IC	$\mu$ PD4094BG-T1
IC9	1130004730	IC	BU4066BF-T1

## [MAIN A UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
D18	1790000450	Diode	MA862 (TX)
D19	1710000290	Diode	MI308
D20	1710000290	Diode	MI308
D21	1790000490	Diode	HSM88AS-TR
D23	1790000470	Diode	MA159 (TX)
D24	1750000070	Diode	1SS226 (TE85R)
F11	2010000580	Filter	17M15B (FL-75)
F12	2020000550	Ceramic Filter	CFUM455E
X1	6070000060	Discriminator	CDBM455C7
X2	6050003010	Crystal	CR-166
L1	6140001840	Coil	LR-220
L2	6180001470	Coil	LAL 02KR 3R3K
L3	6200000830	Coil	LQH 3N 3R3M
L4	6110001610	Coil	LA-244
L5	6110001540	Coil	LA-234
L6	6110001610	Coil	LA-244 (IC-3220A/E)
	6200000100	Coil	LQN 2A 22NM (IC-3220H)
L7	6110001530	Coil	LA-233 (IC-3220A/E)
	6200000090	Coil	LQN 2A 18NM (IC-3220H)
L8	6110001540	Coil	LA-234
L9	6170000180	Coil	LW-19
L10	6110002070	Coil	LA-227 (IC-3220A/E)
	6110001520	Coil	LA-232 (IC-3220H)
L11	6110001620	Coil	LA-245
L12	6110001610	Coil	LA-244
L13	6180000900	Coil	LAL 03NA 101K
L14	6150003150	Coil	LS-331
L15	6150003150	Coil	LS-331
L16	6150002810	Coil	LS-291
L17	6150002810	Coil	LS-291
L18	6150002810	Coil	LS-291
L19	6150002810	Coil	LS-291
L20	6110001550	Coil	LA-235
L21	6110001550	Coil	LA-235
L22	6150003120	Coil	LS-321
L23	6150003120	Coil	LS-321
L24	6180001620	Coil	LAL 02KR R22K
R3	7030001090	Resistor	MCR50JZHJ 47 $\Omega$ (470) (IC-3220A/E)
	7030001070	Resistor	MCR50JZHJ 33 $\Omega$ (330) (IC-3220H)
R4	7030003560	Resistor	ERJ3GEYJ 103 V (10 k $\Omega$ )
R5	7030003640	Resistor	ERJ3GEYJ 473 V (47 k $\Omega$ )
R6	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 k $\Omega$ )
R7	7030003560	Resistor	ERJ3GEYJ 103 V (10 k $\Omega$ )
R10	7030000340	Resistor	MCR10EZHJ 470 $\Omega$ (471)
R11	7030003540	Resistor	ERJ3GEYJ 682 V (6.8 k $\Omega$ )
R12	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 k $\Omega$ )
R13	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 k $\Omega$ )
R14	7030003370	Resistor	ERJ3GEYJ 271 V (270 $\Omega$ )
R15	7030003230	Resistor	ERJ3GEYJ 180 V (18 $\Omega$ )
R16	7030003370	Resistor	ERJ3GEYJ 271 V (270 $\Omega$ )
R17	7030003280	Resistor	ERJ3GEYJ 470 V (47 $\Omega$ )
R18	7030003320	Resistor	ERJ3GEYJ 101 V (100 $\Omega$ )
R19	7030003320	Resistor	ERJ3GEYJ 101 V (100 $\Omega$ )
R20	7030003280	Resistor	ERJ3GEYJ 470 V (47 $\Omega$ )
R21	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 k $\Omega$ )
R22	7030003420	Resistor	ERJ3GEYJ 681 V (680 $\Omega$ )
R23	7030003280	Resistor	ERJ3GEYJ 470 V (47 $\Omega$ )
R24	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 k $\Omega$ )
R25	7030003420	Resistor	ERJ3GEYJ 681 V (680 $\Omega$ )
R26	7030003500	Resistor	ERJ3GEYJ 332 V (3.3 k $\Omega$ )
R27	7030003440	Resistor	ERJ3GEYJ 102 V (1 k $\Omega$ )

## [MAIN A UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R28	7030003280	Resistor	ERJ3GEYJ 470 V (47 $\Omega$ )
R29	7030003490	Resistor	ERJ3GEYJ 272 V (2.7 k $\Omega$ )
R30	7030003440	Resistor	ERJ3GEYJ 102 V (1 k $\Omega$ )
R31	7030003370	Resistor	ERJ3GEYJ 271 V (270 $\Omega$ )
R32	7030003230	Resistor	ERJ3GEYJ 180 V (18 $\Omega$ )
R33	7030003370	Resistor	ERJ3GEYJ 271 V (270 $\Omega$ )
R34	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 k $\Omega$ ) (IC-3220A/E)
	7030003560	Resistor	ERJ3GEYJ 103 V (10 k $\Omega$ ) (IC-3220H)
R35	4610001020	Trimmer	EVMLGGA00B24 (203)
R36	7030003540	Resistor	ERJ3GEYJ 682 V (6.8 k $\Omega$ )
R37	7030003540	Resistor	ERJ3GEYJ 682 V (6.8 k $\Omega$ ) (IC-3220A/E)
	7030003510	Resistor	ERJ3GEYJ 392 V (3.9 k $\Omega$ ) (IC-3220H)
R40	7030003440	Resistor	ERJ3GEYJ 102 V (1 k $\Omega$ ) (IC-3220A/E)
	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 k $\Omega$ ) (IC-3220H)
R41	7030001010	Resistor	MCR50JZHJ 10 $\Omega$ (100)
R42	7030000280	Resistor	MCR10EZHJ 150 $\Omega$ (151) (IC-3220A/E)
R43	7030001190	Resistor	MCR50JZHJ 330 $\Omega$ (331) (IC-3220A/E)
	7030001170	Resistor	MCR50JZHJ 220 $\Omega$ (221) (IC-3220H)
R44	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 k $\Omega$ ) (IC-3220A/E)
	7030003500	Resistor	ERJ3GEYJ 332 V (3.3 k $\Omega$ ) (IC-3220H)
R45	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 k $\Omega$ ) (IC-3220A/E)
	7030003500	Resistor	ERJ3GEYJ 332 V (3.3 k $\Omega$ ) (IC-3220H)
R46	7030003450	Resistor	ERJ3GEYJ 122 V (1.2 k $\Omega$ ) (IC-3220A/E)
	7030003380	Resistor	ERJ3GEYJ 331 V (330 $\Omega$ ) (IC-3220H)
R47	7030003450	Resistor	ERJ3GEYJ 122 V (1.2 k $\Omega$ ) (IC-3220A/E)
	7030003380	Resistor	ERJ3GEYJ 331 V (330 $\Omega$ ) (IC-3220H)
R48	7030001090	Resistor	MCR50JZHJ 47 $\Omega$ (470) (IC-3220A/E)
	7030001070	Resistor	MCR50JZHJ 33 $\Omega$ (330) (IC-3220H)
R49	7030003320	Resistor	ERJ3GEYJ 101 V (100 $\Omega$ )
R50	7030003440	Resistor	ERJ3GEYJ 102 V (1 k $\Omega$ )
R51	7030003680	Resistor	ERJ3GEYJ 104 V (100 k $\Omega$ )
R52	7030003680	Resistor	ERJ3GEYJ 104 V (100 k $\Omega$ )
R53	7030003680	Resistor	ERJ3GEYJ 104 V (100 k $\Omega$ )
R56	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 k $\Omega$ ) (USA), (USA-H)
	7030003470	Resistor	ERJ3GEYJ 182 V (1.8 k $\Omega$ ) (EUR), (EUR-H), (ITA), (ITA-H), (AUS), (AUS-H), (SEA), (SEA-H)
R57	7030003450	Resistor	ERJ3GEYJ 122 V (1.2 k $\Omega$ ) (USA), (USA-H)
	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 k $\Omega$ ) (EUR), (EUR-H), (ITA), (ITA-H), (AUS), (AUS-H), (SEA), (SEA-H)
R58	4610001020	Trimmer	EVMLGGA00B24 (203)
R59	4610001020	Trimmer	EVMLGGA00B24 (203)
R62	7030000280	Resistor	MCR10EZHJ 100 $\Omega$ (101)
R63	7030003600	Resistor	ERJ3GEYJ 223 V (22 k $\Omega$ )
R64	4610001020	Trimmer	EVMLGGA00B24 (203)
R66	7030003440	Resistor	ERJ3GEYJ 102 V (1 k $\Omega$ )
R67	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 k $\Omega$ )
R68	7030003730	Resistor	ERJ3GEYJ 274 V (270 k $\Omega$ )
R69	7030003730	Resistor	ERJ3GEYJ 274 V (270 k $\Omega$ )

[MAIN A UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
R70	7030003520	Resistor ERJ3GEYJ 472 V (4.7 kΩ)
R71	7030003400	Resistor ERJ3GEYJ 471 V (470 Ω)
R72	7030003600	Resistor ERJ3GEYJ 223 V (22 kΩ) (IC-3220A/E)
	7030003480	Resistor ERJ3GEYJ 222 V (2.2 kΩ) (IC-3220H)
R73	7030003440	Resistor ERJ3GEYJ 102 V (1 kΩ)
R76	7030003960	Resistor ERSM30J 103U
R77	7030003600	Resistor ERJ3GEYJ 223 V (22 kΩ) (IC-3220A/E)
	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ) (IC-3220H)
R78	7030003720	Resistor ERJ3GEYJ 224 V (220 kΩ) (IC-3220A/E)
	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ) (IC-3220H)
R79	7030003840	Resistor ERJ3GEYJ 225 V (2.2 MΩ)
R80	7030003480	Resistor ERJ3GEYJ 272 V (2.7 kΩ)
R81	7030003520	Resistor ERJ3GEYJ 472 V (4.7 kΩ)
R83	7030003630	Resistor ERJ3GEYJ 393 V (39 kΩ)
R85	7030003470	Resistor ERJ3GEYJ 182 V (1.8 kΩ)
R87	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R88	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R89	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R90	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R91	7030003320	Resistor ERJ3GEYJ 101 V (100 Ω)
R93	7030003400	Resistor ERJ3GEYJ 471 V (470 Ω)
R94	7030003480	Resistor ERJ3GEYJ 222 V (2.2 kΩ)
R95	7010004270	Resistor R20J 4.7 kΩ
R96	7030003580	Resistor ERJ3GEYJ 103 V (10 kΩ)
R97	7030003320	Resistor ERJ3GEYJ 101 V (100 Ω)
R98	7030003370	Resistor ERJ3GEYJ 271 V (270 Ω)
R99	7030003580	Resistor ERJ3GEYJ 103 V (10 kΩ)
R100	7030003550	Resistor ERJ3GEYJ 822 V (8.2 kΩ)
R101	7030003560	Resistor ERJ3GEYJ 103 V (10 kΩ)
R102	7030003560	Resistor ERJ3GEYJ 103 V (10 kΩ)
R103	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R104	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R105	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R106	7030003280	Resistor ERJ3GEYJ 470 V (47 Ω)
R107	7030003200	Resistor ERJ3GEYJ 100 V (10 Ω)
R108	7030003310	Resistor ERJ3GEYJ 820 V (82 Ω)
R109	7030003600	Resistor ERJ3GEYJ 223 V (22 kΩ)
R110	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R111	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R112	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R113	7030003580	Resistor ERJ3GEYJ 103 V (10 kΩ)
R114	7030003480	Resistor ERJ3GEYJ 152 V (1.5 kΩ)
R115	7030003320	Resistor ERJ3GEYJ 101 V (100 Ω)
R116	7030003280	Resistor ERJ3GEYJ 470 V (47 Ω)
R117	7030003650	Resistor ERJ3GEYJ 563 V (56 kΩ)
R118	7030003560	Resistor ERJ3GEYJ 103 V (10 kΩ)
R119	7030003430	Resistor ERJ3GEYJ 821 V (820 Ω)
R120	7030003500	Resistor ERJ3GEYJ 332 V (3.3 kΩ)
R121	7030003550	Resistor ERJ3GEYJ 822 V (8.2 kΩ)
R122	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R123	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R124	7030003550	Resistor ERJ3GEYJ 822 V (8.2 kΩ)
R125	7030003500	Resistor ERJ3GEYJ 332 V (3.3 kΩ)
R126	7030003430	Resistor ERJ3GEYJ 821 V (820 Ω)
R127	7030003580	Resistor ERJ3GEYJ 103 V (10 kΩ)
R128	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R129	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R130	7030003440	Resistor ERJ3GEYJ 102 V (1 kΩ)
R131	7030003440	Resistor ERJ3GEYJ 102 V (1 kΩ)
R133	7030003580	Resistor ERJ3GEYJ 103 V (10 kΩ)
R134	7030003600	Resistor ERJ3GEYJ 223 V (22 kΩ)
R135	7030000260	Resistor MCR10EZJH 100 Ω (101)
R136	7030003280	Resistor ERJ3GEYJ 470 V (47 Ω)
R137	7030003740	Resistor ERJ3GEYJ 334 V (330 kΩ)
R138	7030003480	Resistor ERJ3GEYJ 222 V (2.2 kΩ)

[MAIN A UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
R139	7030003630	Resistor ERJ3GEYJ 393 V (39 kΩ)
R140	7030003480	Resistor ERJ3GEYJ 222 V (2.2 kΩ)
R141	7030003760	Resistor ERJ3GEYJ 474 V (470 kΩ)
R142	7030003380	Resistor ERJ3GEYJ 331 V (330 Ω)
R143	7030003600	Resistor ERJ3GEYJ 223 V (22 kΩ)
R144	7030003760	Resistor ERJ3GEYJ 474 V (470 kΩ)
R146	7030003840	Resistor ERJ3GEYJ 473 V (47 kΩ)
R147	7030003480	Resistor ERJ3GEYJ 222 V (2.2 kΩ)
R148	7030003520	Resistor ERJ3GEYJ 472 V (4.7 kΩ)
R149	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R150	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R151	7030003200	Resistor ERJ3GEYJ 100 V (10 Ω)
R152	7030003440	Resistor ERJ3GEYJ 102 V (1 kΩ)
R153	7030000080	Resistor MCR10EZJH 3.3 Ω (3R3)
R154	7030000060	Resistor MCR10EZJH 2.2 Ω (2R2)
R155	7030003600	Resistor ERJ3GEYJ 223 V (22 kΩ)
R159	7030001170	Resistor MCR5QJZH 220 Ω (221)
R160	7030003470	Resistor ERJ3GEYJ 182 V (1.8 kΩ)
R161	7030003450	Resistor ERJ3GEYJ 122 V (1.2 kΩ)
R162	7030003650	Resistor ERJ3GEYJ 563 V (56 kΩ)
R163	7030003610	Resistor ERJ3GEYJ 273 V (27 kΩ)
R164	7030003610	Resistor ERJ3GEYJ 273 V (27 kΩ)
R165	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R166	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R167	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R168	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R169	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R170	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R171	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R172	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R173	7030003440	Resistor ERJ3GEYJ 102 V (1 kΩ)
R174	7030003580	Resistor ERJ3GEYJ 103 V (10 kΩ)
R176	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R177	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ) (USA),(USA-H)
	7030003570	Resistor ERJ3GEYJ 123 V (12 kΩ) (EUR),(EUR-H),(ITA),(ITA-H), (AUS),(AUS-H),(SEA),(SEA-H)
R178	7030003570	Resistor ERJ3GEYJ 123 V (12 kΩ)
R179	7030003440	Resistor ERJ3GEYJ 102 V (1 kΩ)
R182	7030003590	Resistor ERJ3GEYJ 183 V (18 kΩ)
R183	7030003540	Resistor ERJ3GEYJ 882 V (8.8 kΩ)
R184	7030003440	Resistor ERJ3GEYJ 102 V (1 kΩ)
R185	7030003350	Resistor ERJ3GEYJ 181 V (180 Ω)
R186	7030003350	Resistor ERJ3GEYJ 181 V (180 Ω)
R187	7030003610	Resistor ERJ3GEYJ 273 V (27 kΩ)
R188	7030003370	Resistor ERJ3GEYJ 271 V (270 Ω)
R189	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R190	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R191	7030003670	Resistor ERJ3GEYJ 823 V (82 kΩ)
R192	4810001110	Trimmer EVMLGGA00B15 (104)
R193	7030003510	Resistor ERJ3GEYJ 392 V (3.9 kΩ)
R194	7030003580	Resistor ERJ3GEYJ 153 V (15 kΩ) (USA),(USA-H)
	7030003630	Resistor ERJ3GEYJ 393 V (39 kΩ) (EUR),(EUR-H),(ITA),(ITA-H), (AUS),(AUS-H),(SEA),(SEA-H)
R195	7030003560	Resistor ERJ3GEYJ 103 V (10 kΩ)
R196	7030003600	Resistor ERJ3GEYJ 223 V (22 kΩ)
C1	4510001120	Electrolytic 25 MS7 4R7 μF
C2	4030006850	Ceramic C1608 JB 1H 471K T-A
C3	4030006860	Ceramic C1608 JB 1H 102K T-A
C4	4030006860	Ceramic C1608 JB 1H 102K T-A
C5	4030006850	Ceramic C1608 JB 1H 471K T-A
C6	4030006860	Ceramic C1608 JB 1H 102K T-A
C7	4030006860	Ceramic C1608 JB 1H 102K T-A
C8	4030006860	Ceramic C1608 JB 1H 102K T-A
C9	4030006860	Ceramic C1608 JB 1H 102K T-A
C10	4030006860	Ceramic C1608 JB 1H 102K T-A



## [MAIN A UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
C11	4030006880	Ceramic C1608 JB 1H 102K- T-A
C12	4030006880	Ceramic C1608 JB 1H 102K- T-A
C13	4510002640	Electrolytic 25 SS 47 $\mu$ F
C14	4550000260	Tantalum DN 1V 100M
C15	4550000260	Tantalum DN 1V 100M
C16	4510002960	Electrolytic 50 SS 3R3 $\mu$ F
C17	4030006850	Ceramic C1608 JB 1H 471K- T-A
C18	4030006860	Ceramic C1608 JB 1H 102K- T-A
C19	4030006860	Ceramic C1608 JB 1H 102K- T-A
C20	4510002640	Electrolytic 25 SS 47 $\mu$ F
C21	4030006860	Ceramic C1608 JB 1H 102K- T-A
C22	4550000320	Tantalum DN 1V 0R1M
C23	4030006860	Ceramic C1608 JB 1H 102K- T-A
C24	4030006860	Ceramic C1608 JB 1H 102K- T-A
C25	4030006860	Ceramic C1608 JB 1H 102K- T-A
C26	4030006860	Ceramic C1608 SL 1H 220J- T-A
C27	4030006860	Ceramic C1608 SL 1H 220J- T-A
C28	4030006860	Ceramic C1608 SL 1H 050C- T-A
C29	4030006860	Ceramic C1608 JB 1H 102K- T-A
C30	4030006570	Ceramic C1608 SL 1H 060D- T-A
C31	4030006610	Ceramic C1608 SL 1H 100D- T-A
C32	4030006660	Ceramic C1608 SL 1H 220J- T-A
C33	4030006620	Ceramic C1608 SL 1H 120J- T-A (IC-3220A/E)
	4030006610	Ceramic C1608 SL 1H 100D- T-A (IC-3220H)
C34	4030006860	Ceramic C1608 JB 1H 102K- T-A
C35	4030006860	Ceramic C1608 JB 1H 102K- T-A
C36	4030006860	Ceramic C1608 JB 1H 102K- T-A
C37	4030006860	Ceramic C1608 JB 1H 102K- T-A
C38	4030006860	Ceramic C1608 JB 1H 102K- T-A
C39	4030006860	Ceramic C1608 SL 1H 220J- T-A
C40	4030006850	Ceramic C1608 JB 1H 471K- T-A
C41	4030006860	Ceramic C1608 JB 1H 102K- T-A
C42	4030006590	Ceramic C1608 SL 1H 070D- T-A
C43	4030006860	Ceramic C1608 JB 1H 102K- T-A
C44	4030006850	Ceramic C1608 JB 1H 471K- T-A
C45	4030006860	Ceramic C1608 JB 1H 102K- T-A
C46	4030006860	Ceramic C1608 SL 1H 220J- T-A
C47	4030006860	Ceramic C1608 SL 1H 220J- T-A (IC-3220A/E)
C48	4030006610	Ceramic C1608 SL 1H 100D- T-A
C49	4030006660	Ceramic C1608 SL 1H 220J- T-A
C50	4030006860	Ceramic C1608 JB 1H 102K- T-A
C51	4030006850	Ceramic C1608 JB 1H 471K- T-A
C52	4030006850	Ceramic C1608 JB 1H 471K- T-A
C53	4030006860	Ceramic C1608 JB 1H 102K- T-A
C54	4030006860	Ceramic C1608 JB 1H 102K- T-A
C55	4550000260	Tantalum DN 1V 100M
C56	4030006860	Ceramic C1608 JB 1H 102K- T-A
C57	4030006850	Ceramic C1608 JB 1H 471K- T-A
C58	4030006860	Ceramic C1608 JB 1H 102K- T-A
C59	4030006860	Ceramic C1608 JB 1H 102K- T-A
C60	4030006850	Ceramic C1608 JB 1H 471K- T-A
C61	4510002440	Electrolytic 16 SS 220 $\mu$ F (6X11)
C62	4030006860	Ceramic C1608 JB 1H 102K- T-A
C63	4030006850	Ceramic C1608 JB 1H 471K- T-A
C64	4030006850	Ceramic C1608 JB 1H 471K- T-A
C65	4030006860	Ceramic C1608 JB 1H 102K- T-A
C66	4010003880	Ceramic DD06 SL 150K 500V
C67	4010003880	Ceramic DD06 SL 150K 500V
C68	4010004120	Ceramic DD07 B 102K 500V
C69	4010004120	Ceramic DD07 B 102K 500V
C70	4010003880	Ceramic DD06 SL 150K 500V (IC-3220A/E)
	4010003890	Ceramic DD06 SL 180K 500V (IC-3220H)
C71	4010003890	Ceramic DD06 SL 180K 500V (IC-3220A/E)
	4010003930	Ceramic DD06 SL 270K 500V (IC-3220H)

## [MAIN A UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
C72	4010003930	Ceramic DD06 SL 270K 500V
C73	4030006860	Ceramic C1608 JB 1H 102K- T-A
C74	4030006860	Ceramic C1608 JB 1H 102K- T-A
C75	4030006860	Ceramic C1608 JB 1H 102K- T-A
C76	4030006860	Ceramic C1608 JB 1H 102K- T-A
C77	4030006860	Ceramic C1608 JB 1H 102K- T-A
C78	4030006860	Ceramic C1608 JB 1H 102K- T-A
C79	4010003890	Ceramic DD06 SL 180K 500V
C80	4030006700	Ceramic C1608 SL 1H 390J- T-A
C81	4030006660	Ceramic C1608 SL 1H 220J- T-A
C82	4030006850	Ceramic C1608 JB 1H 471K- T-A
C83	4030006860	Ceramic C1608 JB 1H 102K- T-A
C84	4030006860	Ceramic C1608 JB 1H 102K- T-A
C85	4030006860	Ceramic C1608 JB 1H 102K- T-A
C86	4030006860	Ceramic C1608 JB 1H 102K- T-A
C87	4020000060	Cylinder UP125 SL 5R6K
C88	4030006510	Ceramic C1608 SL 1H 0R5C- T-A
C89	4030006670	Ceramic C1608 SL 1H 270J- T-A
C90	4030006750	Ceramic C1608 SL 1H 101J- T-A
C91	4030006850	Ceramic C1608 JB 1H 102K- T-A
C92	4030006860	Ceramic C1608 JB 1H 102K- T-A
C93	4030006860	Ceramic C1608 JB 1H 102K- T-A
C94	4030006860	Ceramic C1608 JB 1H 102K- T-A
C95	4030006860	Ceramic C1608 JB 1H 102K- T-A
C96	4030006860	Ceramic C1608 JB 1H 102K- T-A
C97	4030006860	Ceramic C1608 JB 1H 102K- T-A
C98	4030006860	Ceramic C1608 JB 1H 102K- T-A
C99	4030006520	Ceramic C1608 SL 1H 010C- T-A
C100	4030006610	Ceramic C1608 SL 1H 100D- T-A
C101	4030006510	Ceramic C1608 SL 1H 0R5C- T-A
C102	4030006610	Ceramic C1608 SL 1H 100D- T-A
C103	4030006520	Ceramic C1608 SL 1H 010C- T-A
C104	4030006510	Ceramic C1608 SL 1H 0R5C- T-A
C105	4030006590	Ceramic C1608 SL 1H 060D- T-A
C106	4030006510	Ceramic C1608 SL 1H 0R5C- T-A
C107	4030006810	Ceramic C1608 SL 1H 100D- T-A
C108	4020000330	Cylinder UP125 SL 180J
C109	4030006860	Ceramic C1608 JB 1H 102K- T-A
C110	4030006690	Ceramic C1608 SL 1H 330J- T-A
C111	4030006600	Ceramic C1608 SL 1H 090D- T-A
C112	4030006860	Ceramic C1608 JB 1H 102K- T-A
C113	4030006860	Ceramic C1608 JB 1H 102K- T-A
C114	4030006620	Ceramic C1608 SL 1H 120J- T-A
C115	4030006860	Ceramic C1608 JB 1H 102K- T-A
C116	4030006850	Ceramic C1608 JB 1H 471K- T-A
C117	4030006860	Ceramic C1608 JB 1H 102K- T-A
C118	4030006860	Ceramic C1608 JB 1H 102K- T-A
C119	4030006860	Ceramic C1608 JB 1H 102K- T-A
C120	4030006860	Ceramic C1608 JB 1H 102K- T-A
C121	4030006850	Ceramic C1608 JB 1H 471K- T-A
C122	4030006860	Ceramic C1608 JB 1H 102K- T-A
C123	4030006860	Ceramic C1608 JB 1H 102K- T-A
C124	4030006860	Ceramic C1608 JB 1H 102K- T-A
C126	4030006900	Ceramic C1608 JB 1E 103K- T-A
C127	4030006860	Ceramic C1608 JB 1H 102K- T-A
C128	4030006730	Ceramic C1608 SL 1H 680J- T-A
C129	4030006860	Ceramic C1608 JB 1H 102K- T-A
C130	4030006540	Ceramic C1608 SL 1H 030C- T-A
C131	4030006730	Ceramic C1608 SL 1H 680J- T-A
C132	4030006860	Ceramic C1608 SL 1H 220J- T-A
C133	4030006860	Ceramic C1608 JB 1H 102K- T-A
C134	4030006860	Ceramic C1608 JB 1H 102K- T-A
C136	4030006860	Ceramic C1608 JB 1H 102K- T-A
C137	4030006860	Ceramic C1608 JB 1H 102K- T-A
C138	4030006760	Ceramic C1608 SL 1H 121J- T-A
C139	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C140	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C141	4510001100	Electrolytic 16 MS7 10 $\mu$ F
C142	4030006710	Ceramic C1608 SL 1H 470J- T-A
C143	4030006860	Ceramic C1608 JB 1H 102K- T-A
C144	4030004760	Ceramic C2012 JF 1E 104Z- T-A

# [MAIN A UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
C145	4030006740	Ceramic C1608 SL 1H 820J -T-A
C146	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C147	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C148	4030006860	Ceramic C1608 JB 1H 102K -T-A
C149	4030006860	Ceramic C1608 JB 1H 102K -T-A
C151	4030006860	Ceramic C1608 JB 1H 102K -T-A
C152	4030006860	Ceramic C1608 JB 1H 102K -T-A
C153	4030006690	Ceramic C1608 SL 1H 330J -T-A
C154	4030006860	Ceramic C1608 JB 1H 102K -T-A
C155	4030006890	Ceramic C1608 JF 1H 103Z -T-A
C156	4510001150	Electrolytic 50 MS7 R47 $\mu$ F
C157	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C158	4030006860	Ceramic C1608 JB 1H 102K -T-A
C159	4030005110	Ceramic C2012 JB 1E 473K -T-A
C160	4510001180	Electrolytic 50 MS7 1 $\mu$ F
C161	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C162	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C163	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C164	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C165	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C166	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C167	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C168	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C169	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C170	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C171	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C172	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C173	4030006900	Ceramic C1608 JB 1E 103K -T-A
C174	4030006470	Ceramic C2012 JB 1H 153K -T-A
C175	4030006860	Ceramic C1608 JB 1H 102K -T-A
C176	4030006860	Ceramic C2012 JB 1H 333K -T-A
C177	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C178	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C179	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C180	4030006470	Ceramic C2012 JB 1H 153K -T-A
C181	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C182	4030006870	Ceramic C2012 JB 1H 562K -T-A
C183	4030006670	Ceramic C2012 JB 1H 562K -T-A
C184	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C185	4030006890	Ceramic C1608 JF 1H 103Z -T-A
C186	4030006860	Ceramic C1608 JB 1H 102K -T-A
C188	4030006600	Ceramic GRM42-6 F 105Z 16 PT
C189	4510002730	Electrolytic 10 SS 100 $\mu$ F
C190	4030006860	Ceramic C1608 JB 1H 471K -T-A
C191	4030006860	Ceramic C1608 JB 1H 102K -T-A
C192	4030006860	Ceramic C1608 JB 1H 102K -T-A
C193	4030006860	Ceramic C1608 JB 1H 102K -T-A
C195	4030006860	Ceramic C1608 JB 1H 102K -T-A
C196	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C197	4030006860	Ceramic C1608 JB 1H 102K -T-A
C199	4030006860	Ceramic C1608 JB 1H 102K -T-A
C200	4030006860	Ceramic C1608 JB 1H 102K -T-A
C201	4030006860	Ceramic C1608 JB 1H 102K -T-A
C202	4030006860	Ceramic C1608 JB 1H 102K -T-A
C203	4030006860	Ceramic C1608 JB 1H 102K -T-A
C204	4030006860	Ceramic C1608 JB 1H 102K -T-A
C205	4030006860	Ceramic C1608 JB 1H 102K -T-A
C206	4030006860	Ceramic C1608 JB 1H 102K -T-A
C207	4030006750	Ceramic C1608 SL 1H 101J -T-A
C208	4030006750	Ceramic C1608 SL 1H 101J -T-A
C209	4030006860	Ceramic C1608 JB 1H 102K -T-A
C210	4030006860	Ceramic C1608 JB 1H 102K -T-A
C211	4030006750	Ceramic C1608 SL 1H 101J -T-A
C212	4030006750	Ceramic C1608 SL 1H 101J -T-A
C213	4030006860	Ceramic C1608 JB 1H 102K -T-A
C214	4030006750	Ceramic C1608 SL 1H 101J -T-A
C215	4030006750	Ceramic C1608 SL 1H 101J -T-A
C216	4030006750	Ceramic C1608 SL 1H 101J -T-A
C221	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C222	4030006860	Ceramic C1608 JB 1H 102K -T-A
C223	4030006600	Ceramic GRM42-6 F 105Z 16 PT

# [MAIN A UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
C224	4510001110	Electrolytic 16 MS7 47 $\mu$ F (6.3X 7)
C225	4510002650	Electrolytic 16 MS7 100 $\mu$ F
C226	4510001110	Electrolytic 16 MS7 47 $\mu$ F (6.3X 7)
C227	4510002440	Electrolytic 16 SS 220 $\mu$ F (6X11)
C228	4510002650	Electrolytic 16 MS7 100 $\mu$ F
C229	4030006760	Ceramic C2012 X7R 1C 104K -T-A
C230	4510001150	Electrolytic 50 MS7 R47 $\mu$ F
C231	4030006880	Ceramic C1608 JB 1H 102K -T-A
C232	4030006860	Ceramic C1608 JB 1H 102K -T-A
C233	4030006900	Ceramic C1608 JB 1E 103K -T-A
C234	4030006740	Ceramic C1608 SL 1H 820J -T-A
C235	4030006600	Ceramic GRM42-6 F 105Z 16 PT
C237	4510001120	Electrolytic 25 MS7 4R7 $\mu$ F
C238	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C239	4030004720	Ceramic C2012 JB 1H 102K -T-A
C240	4030006890	Ceramic C1608 JF 1H 103Z -T-A
C241	4030006860	Ceramic C1608 JB 1H 102K -T-A
C242	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C243	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C244	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C245	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C246	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C247	4030004760	Ceramic C2012 JF 1E 104Z -T-A
C248	4030006860	Ceramic C1608 JB 1H 102K -T-A
C250	4030006890	Ceramic C1608 JF 1H 103Z -T-A
C251	4030006680	Ceramic C2012 JF 1C 105Z -T-A
C252	4550000530	Tantalum TESVA 1V 104M1-8L
C253	4030006680	Ceramic C2012 JF 1C 105Z -T-A
C254	4030006710	Ceramic C1608 SL 1H 470J -T-A
C255	4030006710	Ceramic C1608 SL 1H 470J -T-A
C256	4030006710	Ceramic C1608 SL 1H 470J -T-A
EP1	0910025434	P.C. Board B 2400D (MAIN A)
EP13	6910000440	Bead core V9T2-4-2

# [APC-A UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
IC1	1110001240	IC $\mu$ PC358G2-T1
Q1	1530000180	Transistor 2SC2712-Y (TE85RTEM)
	1530001950	Transistor 2SC2712-GR (TE85R)
		(IC-3220H)
R1	7030000580	Resistor MCR10EZHZ 47 k $\Omega$ (473)
R2	7030000580	Resistor MCR10EZHZ 47 k $\Omega$ (473)
R3	7030000560	Resistor MCR10EZHZ 33 k $\Omega$ (333)
	7030000440	Resistor MCR10EZHZ 3.3 k $\Omega$ (332)
		(IC-3220H)
R4	7030000580	Resistor MCR10EZHZ 47 k $\Omega$ (473)
	7030000460	Resistor MCR10EZHZ 4.7 k $\Omega$ (472)
		(IC-3220H)
R5	7030000500	Resistor MCR10EZHZ 10 k $\Omega$ (103)

# [APC-A UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R6	7030000660	Resistor	MCR10EZHJ 220 k $\Omega$ (224)
R7	7030000610	Resistor	MCR10EZHJ 12 k $\Omega$ (123)
R8	7030000460	Resistor	MCR10EZHJ 4.7 k $\Omega$ (472)
R9	7030000460	Resistor	MCR10EZHJ 4.7 k $\Omega$ (472)
R10	7030000540	Resistor	MCR10EZHJ 22 k $\Omega$ (223)
R11	7030000730	Resistor	MCR10EZHJ 820 k $\Omega$ (824)
R13	7030000080	Resistor	MCR10EZHJ 3.3 $\Omega$ (3R3)
C1	4030004710	Ceramic	C2012 JB 1H 471K- T-A
C2	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C3	4510001820	Electrolytic	10 MS5 10 $\mu$ F (D=3.0)
C4	4510001820	Electrolytic	10 MS5 10 $\mu$ F (D=3.0)
C5	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C6	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C7	4030008680	Ceramic	C2012 JF 1C 105Z- T-A
EP1	0910026240	P.C. Board	B 2403 (APC-A)
EP2	6810001400	Lead Frame	VD2.54-0.7-7

# [MIC-AMP UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1110000960	IC	NJM4558M (T1)
Q1	1530002690	Transistor	2SC4116-GR (TE85R)
R1	7030003680	Resistor	ERJ3GEYJ 104 V (100 k $\Omega$ )
R2	7030003680	Resistor	ERJ3GEYJ 223 V (22 k $\Omega$ )
R3	7030003280	Resistor	ERJ3GEYJ 470 V (47 $\Omega$ )
R4	7030003420	Resistor	ERJ3GEYJ 681 V (680 $\Omega$ )
R5	7030003390	Resistor	ERJ3GEYJ 391 V (390 $\Omega$ )
R6	7030003740	Resistor	ERJ3GEYJ 334 V (330 k $\Omega$ )
R7	7030003750	Resistor	ERJ3GEYJ 394 V (390 k $\Omega$ )
R8	7030003790	Resistor	ERJ3GEYJ 824 V (820 k $\Omega$ )
R9	7030003710	Resistor	ERJ3GEYJ 184 V (180 k $\Omega$ )
R10	7030003560	Resistor	ERJ3GEYJ 103 V (10 k $\Omega$ )
R11	7030003720	Resistor	ERJ3GEYJ 224 V (220 k $\Omega$ )
R12	7030003670	Resistor	ERJ3GEYJ 823 V (82 k $\Omega$ )
R13	7030003670	Resistor	ERJ3GEYJ 823 V (82 k $\Omega$ )
R14	7030003670	Resistor	ERJ3GEYJ 823 V (82 k $\Omega$ )
R15	7030003320	Resistor	ERJ3GEYJ 101 V (100 $\Omega$ )
C1	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C2	4030008660	Ceramic	C1608 JB 1H 102K- T-A
C3	4030008660	Ceramic	C2012 JB 1H 333K- T-A
C4	4550000460	Tantalum	TESVA 1C 105M1-8L
C5	4030007020	Ceramic	C1608 CH 1H 120J- T-A
C6	4030004760	Ceramic	C2012 JF 1E 104Z- T-A
C7	4030008690	Ceramic	C2012 SL 1H 821J- T-A
C8	4030008680	Ceramic	C1608 JB 1H 102K- T-A
C9	4030006740	Ceramic	C1608 SL 1H 820J- T-A
C10	4030008650	Ceramic	C1608 JB 1H 332K- T-A
C11	4030006750	Ceramic	C1608 SL 1H 101J- T-A

# [MIC-AMP UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C12	4550003080	Tantalum	TEMSVA 1A 335M-8L
EP1	0910024852	P.C. Board	B 2377B (MIC-AMP)
EP2	6810003330	Lead Frame	PD2.0-0.9-8

# [V-VCO UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1560000130	FET	2SK125
Q2	1530002210	Transistor	2SC3776-D
D1	1720000300	Varicap	1SV88E
D2	1720000300	Varicap	1SV88E
L1	6180001470	Coil	LAL 02KR 3R3K
L2	6130002350	Coil	LB-259
L3	6180001470	Coil	LAL 02KR 3R3K
L4	6180001470	Coil	LAL 02KR 3R3K
R1	7010003380	Resistor	ELR20J 470 $\Omega$
R2	7010003450	Resistor	ELR20J 2.7 k $\Omega$
R3	7010003360	Resistor	ELR20J 470 $\Omega$
R4	7010003240	Resistor	ELR20J 47 $\Omega$
R5	7010003240	Resistor	ELR20J 47 $\Omega$
R6	7010003280	Resistor	ELR20J 100 $\Omega$
R7	7010003480	Resistor	ELR20J 4.7 k $\Omega$
R8	7010003380	Resistor	ELR20J 680 $\Omega$
R9	7010003240	Resistor	ELR20J 47 $\Omega$
R10	7010003320	Resistor	ELR20J 220 $\Omega$
C1	4010000460	Ceramic	DD104 B 471K 50V
C2	4010000460	Ceramic	DD104 B 471K 50V
C3	4010000500	Ceramic	DD104 B 102K 50V
C5	4010000500	Ceramic	DD104 B 102K 50V
C6	4010000020	Ceramic	DD104 SL 010C 50V
C7	4010000460	Ceramic	DD104 B 471K 50V
C8	4010000330	Ceramic	DD105 SL 101J 50V
C9	4010000460	Ceramic	DD104 B 471K 50V
C10	4510001340	Electrolytic	10 MS5 33 $\mu$ F
EP1	0910014000	P.C. Board	B 1303 (V-VCO)

# [V-PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1130003650	IC	PLL2001S-ET
Q1	1530002060	Transistor	2SC4081 T107 R
Q2	1530002060	Transistor	2SC4081 T107 R
Q3	1510000510	Transistor	2SA1576 T107 R
Q4	1530002060	Transistor	2SC4081 T107 R
Q5	1560000360	FET	2SK209-Y (TE85R)
Q6	1560000360	FET	2SK209-Y (TE85R)
Q7	1510000510	Transistor	2SA1576 T107 R
Q8	1510000510	Transistor	2SA1576 T107 R
D1	1750000160	Diode	DA114 T107
R1	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R2	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R3	7030003650	Resistor	ERJ3GEYJ 563 V (56 kΩ)
R4	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R5	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R6	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R7	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R8	7030003730	Resistor	ERJ3GEYJ 274 V (270 kΩ)
R9	7030003730	Resistor	ERJ3GEYJ 274 V (270 kΩ)
R10	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R11	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R12	7030003370	Resistor	ERJ3GEYJ 271 V (270 Ω)
R13	7030003640	Resistor	ERJ3GEYJ 225 V (2.2 MΩ)
R14	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R15	7030003700	Resistor	ERJ3GEYJ 154 V (150 kΩ)
R16	7030003200	Resistor	ERJ3GEYJ 100 V (10 Ω)
R17	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R18	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 kΩ)
R19	7030003580	Resistor	ERJ3GEYJ 153 V (15 kΩ)
R20	7030003730	Resistor	ERJ3GEYJ 274 V (270 kΩ)
R21	7030003650	Resistor	ERJ3GEYJ 563 V (56 kΩ)
C1	4550000280	Tantalum	TESVB2 1A 475M-8L
C2	4550000310	Tantalum	DN 1V 2R2M
C3	4550000480	Tantalum	TESVA 1C 105M1-8L
C4	4030006560	Ceramic	C1608 SL 1H 050C-T-A
EP1	0910025221	P.C. Board	B 2464A (V-PLL)
EP2	6910003330	Lead Frame	PD2.D-0.9-8

# [MAIN B UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC8	1110000490	IC	AN6541
IC9	1130004200	IC	TC4S66F (TE85R)
Q1	1530000160	Transistor	2SC2712-Y (TE85RTEM)
Q2	1530000160	Transistor	2SC2712-Y (TE85RTEM)
Q3	1530002050	Transistor	2SC3661-TA
Q4	1590000460	Transistor	RN1402 (TE85R)
Q5	1510000580	Transistor	2SA1362-GR (TE85R)
Q6	1530002240	Transistor	2SC3775-3-TA
Q7	1530000160	Transistor	2SC2712-Y (TE85RTEM)
Q8	1510000580	Transistor	2SA1362-GR (TE85R)
Q9	1530002240	Transistor	2SC3775-3-TA
Q10	1590000390	Transistor	MRF559
Q11	1520000380	Transistor	2SB1143 S
Q12	1590000420	Transistor	RN1404 (TE85R)
Q13	1590000420	Transistor	RN1404 (TE85R)
Q14	1530002020	Transistor	2SC3770-3-TA
Q15	1590000420	Transistor	RN1404 (TE85R)
Q16	1580000350	FET	3SK140-Y (TE85R)
Q17	1530002030	Transistor	2SC3772-3-TA
Q18	1580000360	FET	3SK177-T2B U73
Q19	1530000160	Transistor	2SC2712-Y (TE85RT EM)
Q20	1590000460	Transistor	RN1402 (TE85R)
Q21	1590000460	Transistor	RN1402 (TE85R)
Q22	1590000460	Transistor	RN1402 (TE85R)
Q23	1590000980	Transistor	DTB123EK T147
Q24	1590000980	Transistor	DTB123EK T147
Q25	1590000980	Transistor	DTB123EK T147
Q26	1520000080	Transistor	2SB909M R
Q27	1530000160	Transistor	2SC2712-Y (TE85RT EM)
Q28	1530000160	Transistor	2SC2712-Y (TE85RT EM)
Q29	1540000150	Transistor	2SD1225M R
Q30	1590001000	Transistor	RN2427 (TE85R)
Q31	1510000700	Transistor	2SA1736 (TE12R)
D1	1750000050	Diode	1SS193 (TE85R)
D2	1750000080	Diode	1SS153-T2
D3	1790000450	Diode	MA882 (TX)
D6	1790000490	Diode	HSM88AS-TR
D7	1790000490	Diode	HSM88AS-TR
D8	1710000290	Diode	MI308 (IC-3220A/E)
D8	1710000310	Diode	MI407 (IC-3220H)
D9	1750000070	Diode	1SS226 (TE85R)
D10	1790000470	Diode	MA159 (TX)
D11	1790000470	Diode	MA159 (TX)
D12	1790000450	Diode	MA882 (TX)
D13	1710000290	Diode	MI308
D14	1710000290	Diode	MI308
D15	1730000970	Zener	RD15M-T2B2
D16	1750000020	Diode	1SS184 (TE85R)
D17	1790000490	Diode	HSM88AS-TR
D18	1730000730	Zener	RD8.2M-T2B2
D19	1750000050	Diode	1SS193 (TE85R)
D21	1750000050	Diode	1SS193 (TE85R)
D23	1790000700	Diode	DSA3A1
F11	2010000230	Filter	30M15B (FL-76)
F12	2020000550	Ceramic Filter	CFUM455E
X1	6050000690	Crystal	CR-323
X2	6070000010	Discriminator	CDB455C7A
X3	60500005010	Crystal	CR-214
L1	6200000110	Coil	LQN 2A 33NM
L2	6200000090	Coil	LQN 2A 18NM
L4	6200000110	Coil	LQN 2A 33NM

# [MAIN B UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1150000180	IC	SC1027 (IC-3220A/E)
IC1	11500001750	IC	SC1064 (IC-3220H)
IC2	1130003920	IC	TC4S69F (TE85R)
IC3	1130000830	IC	μPD4094BG-T1
IC4	1130004200	IC	TC4S66F (TE85R)
IC5	1120001660	IC	TK10487MTR
IC6	1110001700	IC	TL499ACPS
IC7	1110002020	IC	TA7805S

## [MAIN B UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
L5	6200000720	Coil	LQN 2A 10NM
L6	6200000100	Coil	LQN 2A 22NM
L7	6200000090	Coil	LQN 2A 18NM
L8	6110001150	Coil	LA-153
L9	6170000180	Coil	LW-19
L10	6110001520	Coil	LA-232
L11	6110001520	Coil	LA-232
L12	6110001590	Coil	LA-242
L13	6110001520	Coil	LA-232
L14	6180001210	Coil	LAL 03NA BR2K
L15	6150003220	Coil	LS-320
L16	6150003220	Coil	LS-320
L17	6200000100	Coil	LQN 2A 22NM
L18	6200000090	Coil	LQN 2A 18NM
L19	6150003240	Coil	LS-338 (HR5W)
L20	6150003230	Coil	LS-337 (HR5W)
L21	6200000720	Coil	LQN 2A 10NM
L22	6200000720	Coil	LQN 2A 10NM
L23	6110001520	Coil	LA-232
L24	6110001520	Coil	LA-232
L25	6180002820	Coil	RCR664D-101K
L26	6180001120	Coil	FL 5H 101K
R1	7030000620	Resistor	MCR10EZMJ 100 k $\Omega$ (104)
R2	7030000580	Resistor	MCR10EZMJ 47 k $\Omega$ (473)
R3	7030000470	Resistor	MCR10EZMJ 5.6 k $\Omega$ (562)
R4	7030000420	Resistor	MCR10EZMJ 2.2 k $\Omega$ (222)
R5	7030000260	Resistor	MCR10EZMJ 100 $\Omega$ (101)
R6	7030000580	Resistor	MCR10EZMJ 47 k $\Omega$ (473)
R8	7030000420	Resistor	MCR10EZMJ 2.2 k $\Omega$ (222)
R9	7030000300	Resistor	MCR10EZMJ 220 $\Omega$ (221)
R10	7030000380	Resistor	MCR10EZMJ 1 k $\Omega$ (102)
R11	7030000380	Resistor	MCR10EZMJ 1 k $\Omega$ (102)
R12	7030000420	Resistor	MCR10EZMJ 2.2 k $\Omega$ (222)
R13	7030000420	Resistor	MCR10EZMJ 2.2 k $\Omega$ (222)
R14	7030000480	Resistor	MCR10EZMJ 5.6 k $\Omega$ (562)
R15	7030000260	Resistor	MCR10EZMJ 100 $\Omega$ (101)
R16	7030000380	Resistor	MCR10EZMJ 1 k $\Omega$ (102)
R17	7030000620	Resistor	MCR10EZMJ 100 k $\Omega$ (104)
R18	7030000420	Resistor	MCR10EZMJ 2.2 k $\Omega$ (222)
R19	7030000420	Resistor	MCR10EZMJ 2.2 k $\Omega$ (222)
R20	7030000460	Resistor	MCR10EZMJ 4.7 k $\Omega$ (472)
R21	7030000310	Resistor	MCR10EZMJ 270 $\Omega$ (271)
R22	7030000170	Resistor	MCR10EZMJ 18 $\Omega$ (180)
R23	7030000310	Resistor	MCR10EZMJ 270 $\Omega$ (271)
R24	7030000420	Resistor	MCR10EZMJ 2.2 k $\Omega$ (222)
R25	7030000310	Resistor	MCR10EZMJ 270 $\Omega$ (271)
R26	7030000170	Resistor	MCR10EZMJ 18 $\Omega$ (180)
R27	7030000310	Resistor	MCR10EZMJ 270 $\Omega$ (271)
R28	7030000460	Resistor	MCR10EZMJ 4.7 k $\Omega$ (472)
R29	7030000390	Resistor	MCR10EZMJ 1.2 k $\Omega$ (122)
R30	7030000260	Resistor	MCR10EZMJ 100 $\Omega$ (101)
R31	7030000580	Resistor	MCR10EZMJ 47 k $\Omega$ (473) (IC-3220A/E)
	7030000480	Resistor	MCR10EZMJ 4.7 k $\Omega$ (472) (IC-3220H)
R32	7030000540	Resistor	MCR10EZMJ 22 k $\Omega$ (223)
R33	7030000380	Resistor	MCR10EZMJ 1 k $\Omega$ (102)
R34	7010004690	Resistor	R50XJ 47 $\Omega$ (IC-3220A/E)
	7010004670	Resistor	R50XJ 22 $\Omega$ (IC-3220H)
R35	7030001180	Resistor	MCR50JZMJ 270 $\Omega$ (271)
R36	7010004130	Resistor	R20J 330 $\Omega$
R38	7030000500	Resistor	MCR10EZMJ 10 k $\Omega$ (103)
R40	7030000220	Resistor	MCR10EZMJ 47 $\Omega$ (470)
R41	7010004720	Resistor	R50XJ 100 $\Omega$
R42	7030000480	Resistor	MCR10EZMJ 4.7 k $\Omega$ (472)
R43	7030000380	Resistor	MCR10EZMJ 1 k $\Omega$ (102) (IC-3220A/E)
R43	7030000390	Resistor	MCR10EZMJ 1.2 k $\Omega$ (122) (IC-3220H)

## [MAIN B UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R45	4610001100	Trimmer	EVMLGGA00B34 (303)
R46	7030000400	Resistor	MCR10EZMJ 1.5 k $\Omega$ (152) (IC-3220A/E)
R46	7030000450	Resistor	MCR10EZMJ 3.9 k $\Omega$ (392) (IC-3220H)
R47	7030000480	Resistor	MCR10EZMJ 5.6 k $\Omega$ (562)
R48	7030000490	Resistor	MCR10EZMJ 8.2 k $\Omega$ (822)
R49	7030000500	Resistor	MCR10EZMJ 10 k $\Omega$ (103)
R50	7030000280	Resistor	MCR10EZMJ 150 $\Omega$ (151)
R51	7030000500	Resistor	MCR10EZMJ 10 k $\Omega$ (103)
R52	7030000340	Resistor	MCR10EZMJ 470 $\Omega$ (471)
R53	7030000460	Resistor	MCR10EZMJ 4.7 k $\Omega$ (472)
R54	7030000540	Resistor	MCR10EZMJ 22 k $\Omega$ (223)
R55	7030000260	Resistor	MCR10EZMJ 100 $\Omega$ (101)
R56	7030000280	Resistor	MCR10EZMJ 100 $\Omega$ (101)
R57	7030000300	Resistor	MCR10EZMJ 220 $\Omega$ (221)
R58	7030000340	Resistor	MCR10EZMJ 470 $\Omega$ (471)
R59	7030000380	Resistor	MCR10EZMJ 1 k $\Omega$ (102)
R60	7030000500	Resistor	MCR10EZMJ 10 k $\Omega$ (103)
R61	7030000500	Resistor	MCR10EZMJ 10 k $\Omega$ (103)
R62	7030000380	Resistor	MCR10EZMJ 1 k $\Omega$ (102)
R63	7030000480	Resistor	MCR10EZMJ 6.8 k $\Omega$ (682)
R64	7030000380	Resistor	MCR10EZMJ 1 k $\Omega$ (102)
R65	7030000260	Resistor	MCR10EZMJ 100 $\Omega$ (101)
R66	7030000220	Resistor	MCR10EZMJ 47 $\Omega$ (470)
R68	7030000440	Resistor	MCR10EZMJ 3.3 k $\Omega$ (332)
R69	7030000530	Resistor	MCR10EZMJ 18 k $\Omega$ (183)
R70	7030000250	Resistor	MCR10EZMJ 82 $\Omega$ (820)
R71	7030000620	Resistor	MCR10EZMJ 100 k $\Omega$ (104)
R72	7030000580	Resistor	MCR10EZMJ 33 k $\Omega$ (333)
R73	7030000480	Resistor	MCR10EZMJ 4.7 k $\Omega$ (472)
R74	7030000420	Resistor	MCR10EZMJ 2.2 k $\Omega$ (222)
R75	7030000260	Resistor	MCR10EZMJ 100 $\Omega$ (101)
R76	4610001020	Trimmer	EVMLGGA00B24 (203)
R78	7030000380	Resistor	MCR10EZMJ 1 k $\Omega$ (102)
R79	7030000420	Resistor	MCR10EZMJ 2.2 k $\Omega$ (222)
R80	7030000460	Resistor	MCR10EZMJ 4.7 k $\Omega$ (472)
R83	7030000670	Resistor	MCR10EZMJ 270 k $\Omega$ (274)
R84	7030000340	Resistor	MCR10EZMJ 470 $\Omega$ (471)
R85	7030000440	Resistor	MCR10EZMJ 3.3 k $\Omega$ (332)
R86	7030000460	Resistor	MCR10EZMJ 4.7 k $\Omega$ (472)
R87	7030000540	Resistor	MCR10EZMJ 22 k $\Omega$ (223) (IC-3220A/E)
R87	7030000420	Resistor	MCR10EZMJ 2.2 k $\Omega$ (222) (IC-3220H)
R88	7030000670	Resistor	MCR10EZMJ 270 k $\Omega$ (274)
R89	7030000480	Resistor	MCR10EZMJ 4.7 k $\Omega$ (472)
R90	7030000480	Resistor	MCR10EZMJ 4.7 k $\Omega$ (472)
R91	7030000380	Resistor	MCR10EZMJ 1 k $\Omega$ (102)
R92	7030000380	Resistor	MCR10EZMJ 1 k $\Omega$ (102)
R93	7030000470	Resistor	MCR10EZMJ 5.6 k $\Omega$ (562)
R94	7030000620	Resistor	MCR10EZMJ 100 k $\Omega$ (104)
R95	7030000460	Resistor	MCR10EZMJ 4.7 k $\Omega$ (472)
R96	7030000340	Resistor	MCR10EZMJ 470 $\Omega$ (471)
R97	7010004830	Resistor	R50XJ 4.7 $\Omega$
R98	7030000300	Resistor	MCR10EZMJ 220 $\Omega$ (221)
R101	7010004780	Resistor	R50XJ 470 $\Omega$
R102	7030000500	Resistor	MCR10EZMJ 10 k $\Omega$ (103)
R103	7030003980	Resistor	ERSM30J 103U
R104	7030000400	Resistor	MCR10EZMJ 1.5 k $\Omega$ (152)
R107	7030000220	Resistor	MCR10EZMJ 47 $\Omega$ (470)
R108	4610001250	Trimmer	EVMLGGA00B25 (204)
R109	7030000460	Resistor	MCR10EZMJ 4.7 k $\Omega$ (472)
R110	7030000280	Resistor	MCR10EZMJ 150 $\Omega$ (151)
R111	7030000310	Resistor	MCR10EZMJ 270 $\Omega$ (271)
R112	7520000030	Posistor	PTH59F048G222TS
C1	4030004760	Ceramic	C2012 JF 1E 104Z: T-A
C2	4030004760	Ceramic	C2012 JF 1E 104Z: T-A
C3	4610000380	Trimmer	ECRGA020E30

[MAIN B UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
C4	4030004930	Ceramic C2012 CH 1H 330J- T-A
C5	4030004980	Ceramic C2012 CH 1H 820J- T-A
C6	4030004950	Ceramic C2012 CH 1H 470J- T-A
C7	4510002640	Electrolytic 25 SS 47 $\mu$ F
C8	4030004720	Ceramic C2012 JB 1H 102K- T-A
C9	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C10	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C11	4030004380	Ceramic C2012 SL 1H 010C- T-A
C12	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C13	4030004820	Ceramic C2012 CH 1H 050C- T-A
C14	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C15	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C16	4030004720	Ceramic C2012 JB 1H 102K- T-A
C17	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C18	4030004410	Ceramic C2012 SL 1H 040C- T-A
C19	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C20	4510002930	Electrolytic 50 SS R47 $\mu$ F
C21	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C22	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C23	4030004720	Ceramic C2012 JB 1H 102K- T-A
C24	4030004720	Ceramic C2012 JB 1H 102K- T-A
C25	4030004430	Ceramic C2012 SL 1H 060D- T-A
C26	4030004440	Ceramic C2012 SL 1H 070D- T-A
C27	4030004440	Ceramic C2012 SL 1H 070D- T-A
C28	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C30	4030004720	Ceramic C2012 JB 1H 102K- T-A
C31	4030004720	Ceramic C2012 JB 1H 102K- T-A
C32	4030004720	Ceramic C2012 JB 1H 102K- T-A
C33	4030004720	Ceramic C2012 JB 1H 102K- T-A
C34	4030004520	Ceramic C2012 SL 1H 220J- T-A
C36	4030004720	Ceramic C2012 JB 1H 102K- T-A
C37	4030004410	Ceramic C2012 SL 1H 040C- T-A
C38	4030004440	Ceramic C2012 SL 1H 070D- T-A
C40	4030004710	Ceramic C2012 JB 1H 471K- T-A
C41	4030004710	Ceramic C2012 JB 1H 471K- T-A
C42	4030004710	Ceramic C2012 JB 1H 471K- T-A
C43	4030004710	Ceramic C2012 JB 1H 471K- T-A
C44	4030004520	Ceramic C2012 SL 1H 220J- T-A
C45	4030004710	Ceramic C2012 JB 1H 471K- T-A
C46	4030004430	Ceramic C2012 SL 1H 060D- T-A
C48	4030004430	Ceramic C2012 SL 1H 060D- T-A
C49	4030004720	Ceramic C2012 JB 1H 102K- T-A
C50	4030004720	Ceramic C2012 JB 1H 102K- T-A
C51	4550000260	Tantalum DN 1V 100M
C52	4030004720	Ceramic C2012 JB 1H 102K- T-A
C53	4030004720	Ceramic C2012 JB 1H 102K- T-A
C54	4550000260	Tantalum DN 1V 100M
C55	4030004720	Ceramic C2012 JB 1H 102K- T-A
C56	4030004720	Ceramic C2012 JB 1H 102K- T-A
C57	4010003820	Ceramic DD06 SL 050C 500V
	4010003810	Ceramic DD06 SL 040C 500V (USA)
C58	4030004720	Ceramic C2012 JB 1H 102K- T-A
C59	4030004720	Ceramic C2012 JB 1H 102K- T-A
C60	4010003820	Ceramic DD06 SL 050C 500V
	4010003810	Ceramic DD06 SL 040C 500V (USA)
C61	4010004120	Ceramic DD07 B 102K 500V (IC-3220A/E)
	4010004110	Ceramic DD05 B 471K 500V (IC-3220H)
C62	4030004720	Ceramic C2012 JB 1H 102K- T-A
C63	4030004710	Ceramic C2012 JB 1H 471K- T-A
C64	4030004720	Ceramic C2012 JB 1H 102K- T-A
C65	4010004120	Ceramic DD07 B 102K 500V (IC-3220A/E)
	4010004110	Ceramic DD05 B 471K 500V (IC-3220H)
C66	4010003820	Ceramic DD06 SL 050C 500V
C67	4010003850	Ceramic DD06 SL 080D 500V
C68	4010003830	Ceramic DD06 SL 060D 500V

[MAIN B UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
C69	4010003870	Ceramic DD06 SL 120K 500V
C70	4010003820	Ceramic DD06 SL 050C 500V
C71	4010003860	Ceramic DD06 SL 100D 500V
C72	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C73	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C74	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C75	4030004710	Ceramic C2012 JB 1H 471K- T-A
C76	4510002980	Electrolytic 50 SS 10 $\mu$ F
C77	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C78	4030004570	Ceramic C2012 SL 1H 470J- T-A
C79	4030004480	Ceramic C2012 SL 1H 120J- T-A
C80	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C81	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C82	4030004620	Ceramic C2012 SL 1H 121J- T-A
C83	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C84	4030004570	Ceramic C2012 SL 1H 470J- T-A
C85	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C86	4030004720	Ceramic C2012 JB 1H 102K- T-A
C87	4030004400	Ceramic C2012 SL 1H 030C- T-A
C88	4020000660	Cylinder UP125 SL 120J
C89	4030004710	Ceramic C2012 JB 1H 471K- T-A
C90	4030004520	Ceramic C2012 SL 1H 220J- T-A
C91	4030004380	Ceramic C2012 SL 1H 010C- T-A
C92	4030004720	Ceramic C2012 JB 1H 102K- T-A
C93	4030004720	Ceramic C2012 JB 1H 102K- T-A
C94	4030004710	Ceramic C2012 JB 1H 471K- T-A
C95	4030004720	Ceramic C2012 JB 1H 102K- T-A
C97	4030006180	Ceramic C2012 IJ 1H 040C- T-A
C98	4030004720	Ceramic C2012 JB 1H 102K- T-A
C99	4030004710	Ceramic C2012 JB 1H 471K- T-A
C100	4610001340	Trimmer ECR-LA010A12
C101	4030004720	Ceramic C2012 JB 1H 102K- T-A
C102	4610001340	Trimmer ECR-LA010A12
C104	4030004720	Ceramic C2012 JB 1H 102K- T-A
C105	4030004400	Ceramic C2012 SL 1H 030C- T-A
C106	4030004710	Ceramic C2012 JB 1H 471K- T-A
C107	4030004410	Ceramic C2012 SL 1H 040C- T-A
C108	4030004440	Ceramic C2012 SL 1H 070D- T-A
C109	4010003830	Ceramic DD06 SL 060D 500V
C111	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C112	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C113	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C114	4030004500	Ceramic C2012 SL 1H 180J- T-A
C115	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C116	4030004580	Ceramic C2012 SL 1H 560J- T-A
C117	4030004600	Ceramic C2012 SL 1H 820J- T-A
C119	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C120	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C121	4030004720	Ceramic C2012 JB 1H 102K- T-A
C122	4510002980	Electrolytic 50 SS 10 $\mu$ F
C123	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C124	4030004550	Ceramic C2012 SL 1H 330J- T-A
C125	4030004720	Ceramic C2012 JB 1H 102K- T-A
C126	4030004720	Ceramic C2012 JB 1H 102K- T-A
C127	4030004720	Ceramic C2012 JB 1H 102K- T-A
C128	4030004720	Ceramic C2012 JB 1H 102K- T-A
C129	4030004720	Ceramic C2012 JB 1H 102K- T-A
C130	4510002930	Electrolytic 50 SS R47 $\mu$ F
C131	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C132	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C133	4510002640	Electrolytic 25 SS 47 $\mu$ F
C134	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C135	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C136	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C137	4030006450	Ceramic C2012 JF 1H 103Z- T-A
C138	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C139	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C140	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C141	4030004760	Ceramic C2012 JF 1E 104Z- T-A
C144	4030008680	Ceramic C2012 JF 1C 105Z- T-A
C154	4030004710	Ceramic C2012 JB 1H 471K- T-A

# [MAIN B UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C155	4030004710	Ceramic	C2012 JB 1H 471K- T-A
C156	4030004710	Ceramic	C2012 JB 1H 471K- T-A
C157	4510002640	Electrolytic	25 SS 47 $\mu$ F
C158	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C159	4510003150	Electrolytic	35 SS 33 $\mu$ F
C160	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C161	4510002880	Electrolytic	50 SS 10 $\mu$ F
C162	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C163	4510003150	Electrolytic	35 SS 33 $\mu$ F
C164	4550000320	Tantalum	DN 1V 0R1M
C165	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C166	4510002870	Electrolytic	25 SS 100 $\mu$ F
C167	4510002870	Electrolytic	25 SS 100 $\mu$ F
C168	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C169	4510002840	Electrolytic	25 SS 47 $\mu$ F
C170	4510002640	Electrolytic	25 SS 47 $\mu$ F
C171	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C172	4510002640	Electrolytic	25 SS 47 $\mu$ F
C173	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C174	4030004780	Ceramic	C2012 JF 1E 104Z- T-A
C175	4510002640	Electrolytic	25 SS 47 $\mu$ F
C176	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C177	4030004780	Ceramic	C2012 JF 1E 104Z- T-A
C178	4510002640	Electrolytic	25 SS 47 $\mu$ F
C179	4030004780	Ceramic	C2012 JF 1E 104Z- T-A
C180	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C181	4510002380	Electrolytic	16 SS 470 $\mu$ F (10X1 2.5)
C182	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C183	4030004710	Ceramic	C2012 JB 1H 471K- T-A
C184	4030006450	Ceramic	C2012 JF 1H 103Z- T-A
C185	4030004710	Ceramic	C2012 JB 1H 471K- T-A
C186	4510002380	Electrolytic	16 SS 470 $\mu$ F (10X1 2.5)
C187	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C188	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C189	4030008600	Ceramic	GRM42-6 F 105Z 16 PT
C191	4030008600	Ceramic	GRM42-6 F 105Z 16 PT
C192	4030004570	Ceramic	C2012 SL 1H 470J- T-A
C193	4030004570	Ceramic	C2012 SL 1H 470J- T-A
C194	4030004570	Ceramic	C2012 SL 1H 470J- T-A
C195	4030004570	Ceramic	C2012 SL 1H 470J- T-A
C196	4030004570	Ceramic	C2012 SL 1H 470J- T-A
C197	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C198	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C199	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C200	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C201	4030004520	Ceramic	C2012 SL 1H 220J- T-A
C202	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C203	4030004570	Ceramic	C2012 SL 1H 470J- T-A
C204	4030004570	Ceramic	C2012 SL 1H 470J- T-A
C205	4030004570	Ceramic	C2012 SL 1H 470J- T-A
C206	4030004570	Ceramic	C2012 SL 1H 470J- T-A
C208	4030004710	Ceramic	C2012 JB 1H 471K- T-A
EP1	0910025244	P.C. Board	B 2401D (MAIN B)
EP14	6910000650	Bead core	FSOH081RL
EP15	6910000970	Bead core	DL 20P 2.6-3-1.2H

# [U-PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1120001550	IC	M54959FP
Q1	1560000360	FET	2SK209-Y (TE85R)
Q2	1530001950	Transistor	2SC2712-GR (TE85R)
Q3	1560000130	FET	2SK125
Q4	1530002030	Transistor	2SC3772-3-TA
D1	1720000220	Varicap	1SV166-T2B
D2	1720000220	Varicap	1SV166-T2B
D3	1790000490	Diode	HSM88AS-TR
L2	6200000100	Coil	LQN 2A 22NM
L3	6200000150	Coil	NL 322522T-R39M
L4	6200000160	Coil	NL 322522T-R39M
L5	6200000070	Coil	LQN 2A R15K
L6	6200000110	Coil	LQN 2A 33NM
L7	6200000150	Coil	NL 322522T-1R0M
R1	7030003470	Resistor	ERJ3GEYJ 182 V (1.8 k $\Omega$ )
R2	7030003460	Resistor	ERJ3GEYJ 152 V (1.5 k $\Omega$ )
R4	7030003320	Resistor	ERJ3GEYJ 101 V (100 $\Omega$ )
R5	7030003390	Resistor	ERJ3GEYJ 391 V (390 $\Omega$ )
R6	7030003450	Resistor	ERJ3GEYJ 122 V (1.2 k $\Omega$ )
R7	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 k $\Omega$ )
R8	7030003200	Resistor	ERJ3GEYJ 100 V (10 $\Omega$ )
R9	7030003540	Resistor	ERJ3GEYJ 882 V (8.8 k $\Omega$ )
R10	7030003320	Resistor	ERJ3GEYJ 101 V (100 $\Omega$ )
R11	7030003340	Resistor	ERJ3GEYJ 151 V (150 $\Omega$ )
R12	7030003580	Resistor	ERJ3GEYJ 153 V (15 k $\Omega$ )
R13	7030003630	Resistor	ERJ3GEYJ 393 V (39 k $\Omega$ )
R14	7030003240	Resistor	ERJ3GEYJ 220 V (22 $\Omega$ )
R15	7030003320	Resistor	ERJ3GEYJ 101 V (100 $\Omega$ )
R16	7030003220	Resistor	ERJ3GEYJ 150 V (15 $\Omega$ )
R17	7030003220	Resistor	ERJ3GEYJ 150 V (15 $\Omega$ )
R18	7030003220	Resistor	ERJ3GEYJ 150 V (15 $\Omega$ )
R19	7030003640	Resistor	ERJ3GEYJ 473 V (47 k $\Omega$ )
R20	7030003380	Resistor	ERJ3GEYJ 331 V (330 $\Omega$ )
C1	4030008600	Ceramic	GRM42-6 F 105Z 16 PT
C2	4030008600	Ceramic	C1608 JB 1H 102K- T-A
C3	4030004780	Ceramic	C2012 JF 1E 104Z- T-A
C4	4550003030	Tantalum	TEM5VA 0J 475M-8L
C5	4030006850	Ceramic	C1608 JB 1H 471K- T-A
C6	4030006860	Ceramic	C1608 JB 1H 102K- T-A
C7	4030006580	Ceramic	C1608 SL 1H 070D- T-A
C8	4030006580	Ceramic	C1608 SL 1H 070D- T-A
C9	4550000890	Tantalum	TESVC 1C 475M-12L
C10	4550000550	Tantalum	TESVA 1V 224M1-8L
C11	4030006850	Ceramic	C1608 JB 1H 471K- T-A
C12	4030006720	Ceramic	C1608 SL 1H 560J- T-A
C13	4030006850	Ceramic	C1608 JB 1H 471K- T-A
C14	4030006850	Ceramic	C1608 JB 1H 471K- T-A
C15	4510001340	Electrolytic	10 MS5 33 $\mu$ F
C16	4030006850	Ceramic	C1608 JB 1H 471K- T-A
C17	4030006850	Ceramic	C1608 JB 1H 471K- T-A
C18	4510001840	Electrolytic	10 MS5 47 $\mu$ F
C19	4030006860	Ceramic	C1608 JB 1H 102K- T-A
C20	4030006850	Ceramic	C1608 JB 1H 471K- T-A
C21	4030006850	Ceramic	C1608 JB 1H 471K- T-A
C22	4030006850	Ceramic	C1608 JB 1H 471K- T-A
C23	4030006870	Ceramic	C1608 CH 1H 060D- T-A
C24	4030006560	Ceramic	C1608 SL 1H 050C- T-A
C25	4030006580	Ceramic	C1608 SL 1H 070D- T-A
C26	4030006910	Ceramic	C1608 CH 1H 0R5C- T-A
C27	4030008600	Ceramic	GRM42-6 F 105Z 16 PT

## [U-PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
EP1	0910024832	P.C. Board	B 2402B (U-PLL)

## [A-BAND UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1530002030	Transistor	2SC3772-3-TA
Q2	1530002030	Transistor	2SC3772-3-TA
D1	1790000450	Diode	MA862 (TX)
D3	1790000450	Diode	MA862 (TX)
L1	6200000090	Coil	LQN 2A 18NM
L2	6200000090	Coil	LQN 2A 18NM
L3	6200000090	Coil	LQN 2A 18NM
L4	6200000090	Coil	LQN 2A 18NM
R1	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 k $\Omega$ )
R2	7030003500	Resistor	ERJ3GEYJ 332 V (3.3 k $\Omega$ )
R3	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 k $\Omega$ )
R4	7030003280	Resistor	ERJ3GEYJ 470 V (47 $\Omega$ )
R5	7030003650	Resistor	ERJ3GEYJ 563 V (56 k $\Omega$ )
R6	7030003400	Resistor	ERJ3GEYJ 471 V (470 $\Omega$ )
R7	7030003360	Resistor	ERJ3GEYJ 221 V (220 $\Omega$ )
R8	7030003640	Resistor	ERJ3GEYJ 473 V (47 k $\Omega$ )
R9	7030003280	Resistor	ERJ3GEYJ 470 V (47 $\Omega$ )
R10	7030003280	Resistor	ERJ3GEYJ 470 V (47 $\Omega$ )
R11	7030003400	Resistor	ERJ3GEYJ 471 V (470 $\Omega$ )
R12	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 k $\Omega$ )

## [APC-B UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1110001240	IC	$\mu$ PC358G2-T1
Q1	1530000180	Transistor	2SC2712-Y (TE85RT EM)
R1	7030000580	Resistor	MCR10EZHJ 47 k $\Omega$ (473)
R2	7030000580	Resistor	MCR10EZHJ 47 k $\Omega$ (473)
R3	7030000500	Resistor	MCR10EZHJ 10 k $\Omega$ (103)
R4	7030000580	Resistor	MCR10EZHJ 47 k $\Omega$ (473)
R5	7030000500	Resistor	MCR10EZHJ 10 k $\Omega$ (103)
R6	7030000680	Resistor	MCR10EZHJ 220 k $\Omega$ (224)
R7	7030000510	Resistor	MCR10EZHJ 12 k $\Omega$ (123)
R8	7030000450	Resistor	MCR10EZHJ 3.9 k $\Omega$ (392)
			(IC-3220A/E)
	7030000400	Resistor	MCR10EZHJ 1.5 k $\Omega$ (152)
			(IC-3220H)
R9	7030000490	Resistor	MCR10EZHJ 8.2 k $\Omega$ (822)
			(IC-3220A/E)
	7030000470	Resistor	MCR10EZHJ 5.6 k $\Omega$ (562)
			(IC-3220H)
R10	7030000540	Resistor	MCR10EZHJ 22 k $\Omega$ (223)
R11	7030000730	Resistor	MCR10EZHJ 820 k $\Omega$ (824)
R13	7030000260	Resistor	MCR10EZHJ 100 $\Omega$ (101)
C1	4030004710	Ceramic	C2012 JB 1H 471K- T-A
C2	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C3	4510001820	Electrolytic	10 MS5 10 $\mu$ F (D=3.0)
C4	4510001820	Electrolytic	10 MS5 10 $\mu$ F (D=3.0)
C5	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C6	4030004720	Ceramic	C2012 JB 1H 102K- T-A
C7	4030004710	Ceramic	C2012 JB 1H 471K- T-A
EP1	0910026250	P.C. Board	B 2404 (APC-B)
EP2	6910001400	Lead Frame	VD2.54-0.7-7

C1	4030006860	Ceramic	C1608 JB 1H 102K- T-A
C2	4030006850	Ceramic	C1608 JB 1H 471K- T-A
C3	4030006860	Ceramic	C1608 JB 1H 102K- T-A
C4	4030006860	Ceramic	C1608 JB 1H 102K- T-A
C5	4030006810	Ceramic	C1608 SL 1H 100D- T-A
C6	4030006580	Ceramic	C1608 SL 1H 070D- T-A
C7	4030006850	Ceramic	C1608 JB 1H 471K- T-A
C8	4030006540	Ceramic	C1608 SL 1H 030C- T-A
C9	4030006570	Ceramic	C1608 SL 1H 060D- T-A
C10	4030006570	Ceramic	C1608 SL 1H 060D- T-A
C11	4030006860	Ceramic	C1608 JB 1H 102K- T-A
C12	4030006850	Ceramic	C1608 JB 1H 471K- T-A
C13	4030006800	Ceramic	C1608 SL 1H 090D- T-A
C14	4030006850	Ceramic	C1608 JB 1H 471K- T-A
C15	4030006590	Ceramic	C1608 SL 1H 080D- T-A
C16	4030006860	Ceramic	C1608 JB 1H 102K- T-A

EP1	0910024862	P.C. Board	B 2378B (A-BAND)
EP2	6910003330	Lead Frame	PD2.0-0.9-8



# **[PROGRAMMABLE TONE ENCODER UNIT]**

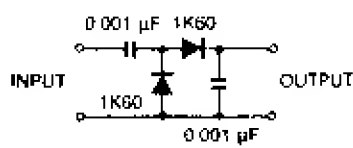
(U.S.A. version only)

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1130000950	IC	S711BA
IC2	1130000830	IC	μPD4094BG-T1
Q1	1530002060	Transistor	2SC4081 T107 R
X1	6060006020	Crystal	CR-288
R1	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 kΩ)
R2	7030003620	Resistor	ERJ3GEYJ 333 V (33 kΩ)
R3	7030003800	Resistor	ERJ3GEYJ 105 V (1 MΩ)
R4	7030003460	Resistor	ERJ3GEYJ 152 V (1.5 kΩ)
R5	7310002600	Trimmer	RV-110 (RH03 A3AS4X0AA) 473
C1	4030006850	Ceramic	C1608 JB 1H 471K- T-A
C2	4550002950	Tantalum	TESVA 0J 335M1-8L
C3	4550000530	Tantalum	TESVA 1V 104M1-8L
C4	4030006880	Ceramic	C1608 SL 1H 330J- T-A
C5	4030006890	Ceramic	C1608 SL 1H 330J- T-A
C6	4550000270	Tantalum	TESVA 1E 474M1-8L
EP1	0910020165	P.C. Board	B 1942E (TONE)

## SECTION 6 ADJUSTMENT PROCEDURES

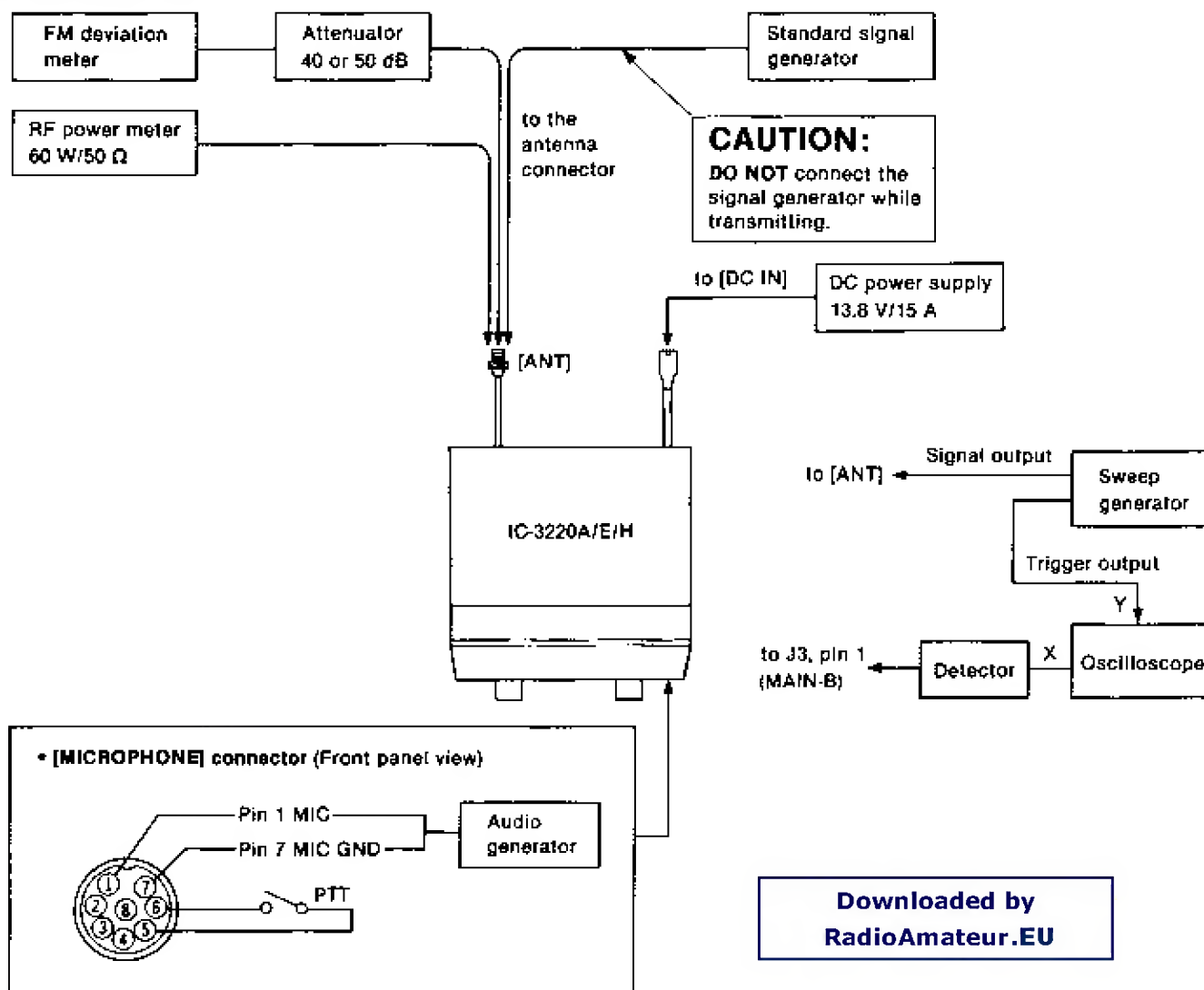
### 6-1 PREPARATION BEFORE SERVICING

#### ■ REQUIRED TEST EQUIPMENT

EQUIPMENT	GRADE AND RANGE	EQUIPMENT	GRADE AND RANGE
DC power supply	Output voltage : 13.8 V DC Current capacity : 15 A or more	Audio generator	Frequency range : 300~3000 Hz Output level : 1~500 mV
RF power meter (terminated type)	Measuring range : 1~60 W Frequency range : 120~460 MHz Impedance : 50 $\Omega$ SWR : Less than 1.2 : 1	Attenuator	Power attenuation : 40 or 50 dB Capacity : 60 W or more
Frequency counter	Frequency range : 0.1~460 MHz Frequency accuracy : $\pm 1$ ppm or better Sensitivity : 100 mV or better	Sweep generator	Frequency range : 0.1~460 MHz Sweep bandwidth : At least 10 MHz Output impedance : 50 $\Omega$
Oscilloscope	Frequency range : DC~20 MHz Measuring range : 0.01~10 V	Detector	
Standard signal generator (SSG)	Frequency range : 0.1~460 MHz Output level : -127~-17 dBm (0.1 $\mu$ V~32 mV)	FM deviation meter	Frequency minimum : 460 MHz Measuring range : 0~ $\pm 10$ kHz
DC voltmeter	Input impedance : 50 k $\Omega$ /DC or better		

CW: Clockwise  
CCW: Counterclockwise

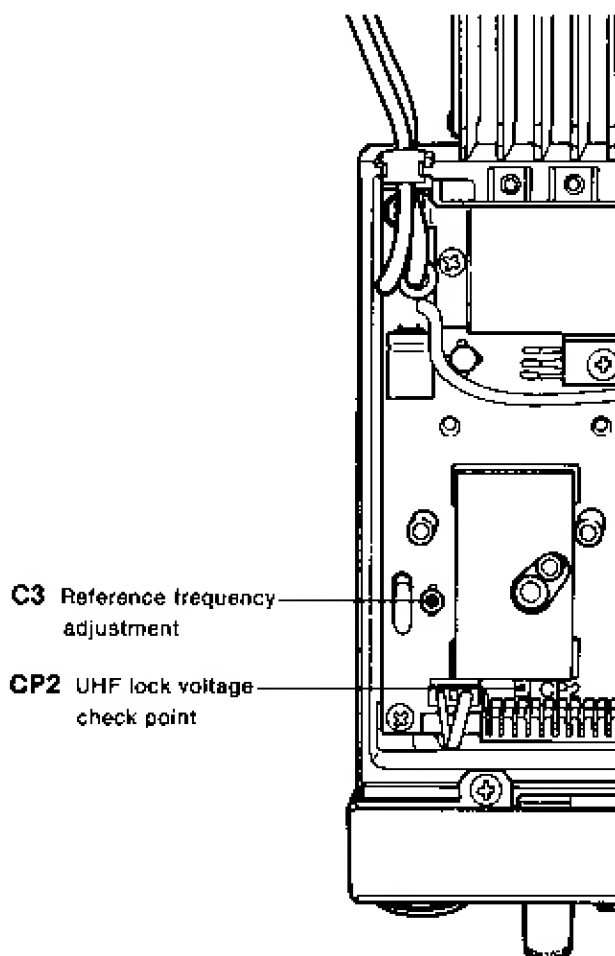
#### ■ CONNECTION



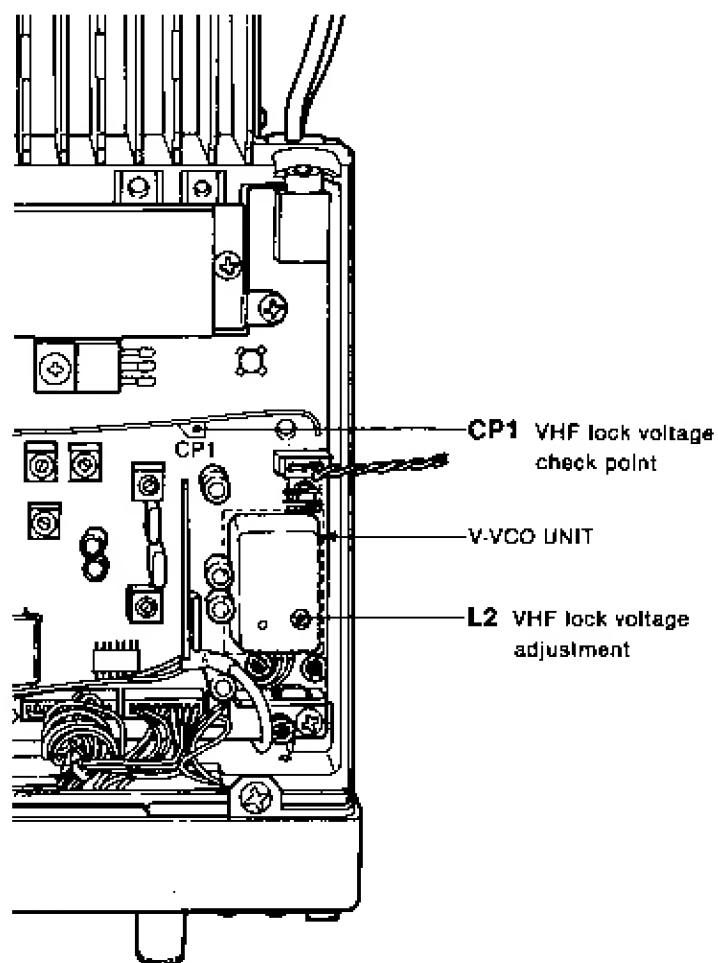
## 6-2 PLL ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
REFERENCE FREQUENCY	1	<ul style="list-style-type: none"> <li>Displayed frequency: 445.0000 MHz (USA version) 435.0000 MHz (All other versions)</li> <li>Connect the RF power meter or a 50 <math>\Omega</math> dummy load to the [ANT] connector.</li> <li>Simplex</li> <li>Transmitting</li> </ul>	Rear panel	Loosely couple the frequency counter to the [ANT] connector.	445.0000 MHz (USA version) 435.0000 MHz (All other versions)	MAIN B	C3
VHF LOCK VOLTAGE	1	<ul style="list-style-type: none"> <li>Displayed frequency: 145.0000 MHz</li> <li>Receiving</li> </ul>	MAIN A	Connect the DC voltmeter to CP1.	8.0 V	MAIN A (V-VCO)	L2
UHF LOCK VOLTAGE	1	<ul style="list-style-type: none"> <li>Displayed frequency: 445.0000 MHz (USA version) 435.0000 MHz (All other versions)</li> <li>Receiving</li> </ul>	MAIN B	Connect the DC voltmeter to CP2.	7.5 V $\pm$ 0.5 V (USA version) 7.0 V $\pm$ 0.5 V (All other versions)	MAIN B	Verify

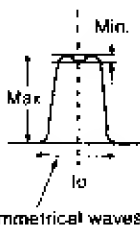


### • MAIN B UNIT



### • MAIN A UNIT



## 6-3 RECEIVER ADJUSTMENT

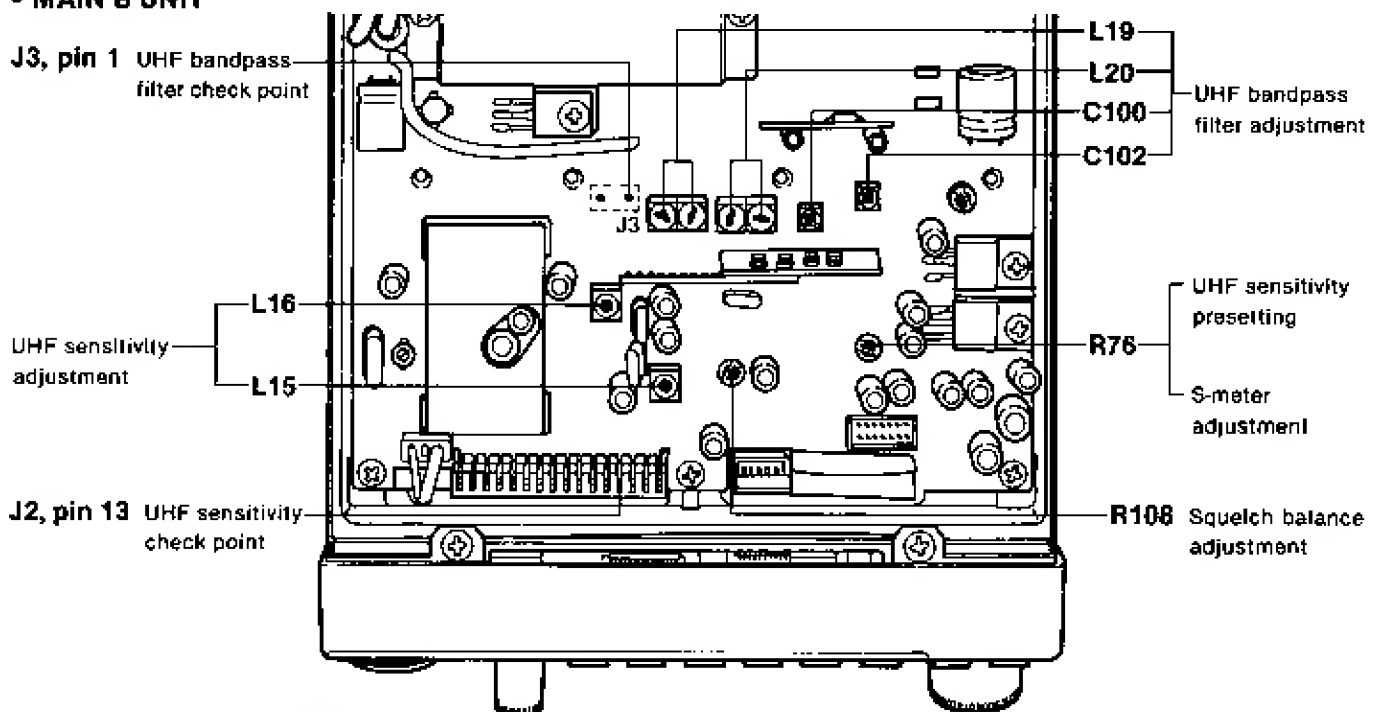
ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
UHF BANDPASS FILTER	1	<ul style="list-style-type: none"><li>• Displayed frequency: 445.0000 MHz (USA version) 435.0000 MHz (All other versions)</li><li>• Connect the sweep generator to the [ANT] connector and set as: Sweep level: 22 mV* (−20 dBm) Center frequency: Same as the displayed frequency Sweep bandwidth: 10 MHz or 20 MHz</li><li>• Receiving</li></ul>	MAIN B	Connect the oscilloscope to J3, pin 1 via the detector.	Adjust as follows: 	MAIN B	C102, C100, L20, L19
UHF SENSITIVITY	1	<ul style="list-style-type: none"><li>• Displayed frequency 445.0000 MHz (USA version) 435.0000 MHz (All other versions)</li><li>• Connect the SSG to the [ANT] connector and set as: Level : 1.0 μV* (−107 dBm) Modulation: 1 kHz Deviation : ±7.0 kHz</li><li>• R76 : Max. CW</li><li>• [SQL] control : Max. CCW</li><li>• Receiving</li></ul>	MAIN B	Connect the DC voltmeter to J2, pin 13.	Maximum	MAIN B	L16, L15
NOTE: Adjust the signal generator output level so that the DC voltmeter needle remains at all times in the lowest 30 % of the full range.							
VHF SENSITIVITY	1	<ul style="list-style-type: none"><li>• Displayed frequency: 146.0000 MHz (USA version) 145.0000 MHz (All other versions)</li><li>• Connect the SSG to the [ANT] connector and set as: Level : 1.0 μV* (−107 dBm) Modulation: 1 kHz Deviation : ±3.5 kHz</li><li>• R64 : Max. CW</li><li>• [SQL] control : Max. CCW</li><li>• Receiving</li></ul>	MAIN A	Connect the DC voltmeter J4, pin 5.	Maximum	MAIN A	Adjust in sequence L19, L18, L17, L16
	2	<ul style="list-style-type: none"><li>• Connect the SSG to the [ANT] connector and set as: Deviation : ±7.0 kHz</li></ul>			Maximum		Adjust in sequence L15, L14
NOTE: Adjust the signal generator output level so that the DC voltmeter needle remains at all times in the lowest 30 % of the full range.							
S-METER	1	<ul style="list-style-type: none"><li>• Displayed frequency: 445.0000 MHz (USA version) 435.0000 MHz (All other versions)</li><li>• Connect the SSG to the [ANT] connector and set as: Level : 1.0 μV* (−107 dBm) Modulation: 1 kHz Deviation : ±3.5 kHz</li><li>• Receiving</li></ul>	Function display	S indicator	4 dots (S3) 	MAIN B	R76
	2	<ul style="list-style-type: none"><li>• Displayed frequency 146.0000 MHz (USA version) 145.0000 MHz (All other versions)</li></ul>			4 dots (S3) 	MAIN A	R64

\* This output level of the standard signal generator (SSG) is indicated as SSG's open circuit.

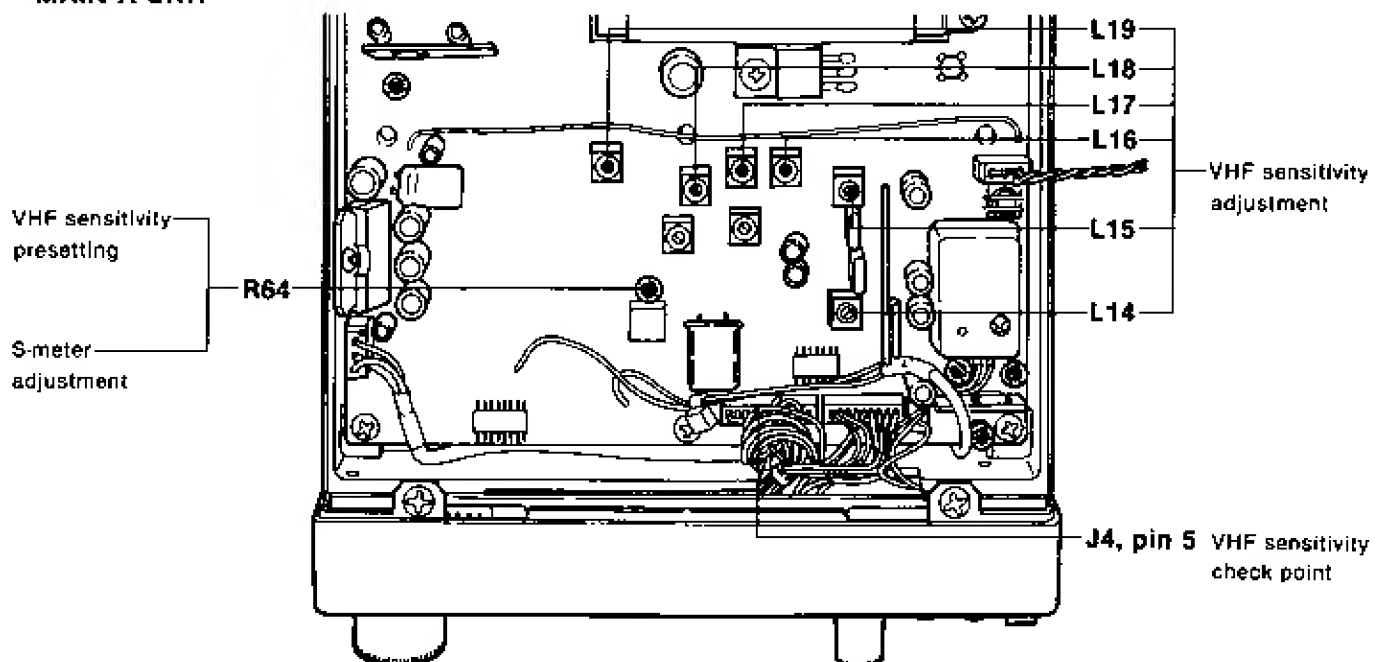
## RECEIVER ADJUSTMENT (CONTINUED)

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
SQUELCH BALANCE	1	<ul style="list-style-type: none"> <li>Displayed frequency: 146.0000 MHz (USA version) 145.0000 MHz (All other versions)</li> <li>Connect the SSG to the [ANT] connector and set as: Level : OFF</li> <li>Receiving</li> </ul>	Top cover	Speaker	Squelch threshold point	Function display	[SQL] control
	2	<ul style="list-style-type: none"> <li>Displayed frequency: 445.0000 MHz (USA version) 435.0000 MHz (All other versions)</li> </ul>					
						MAIN B	R108

### • MAIN B UNIT



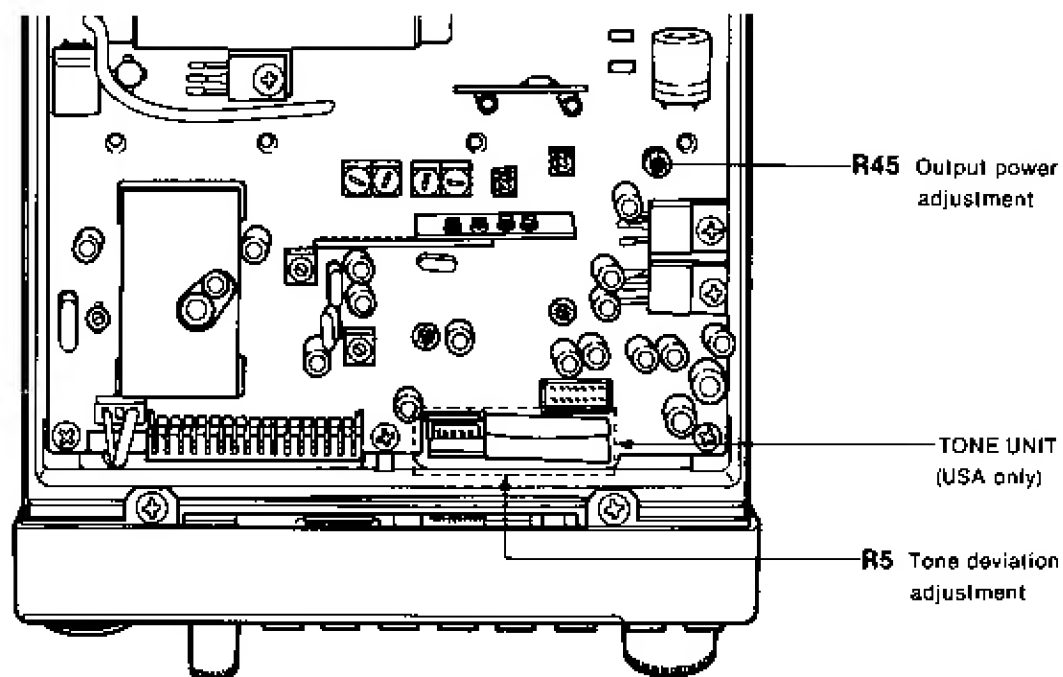
### • MAIN A UNIT



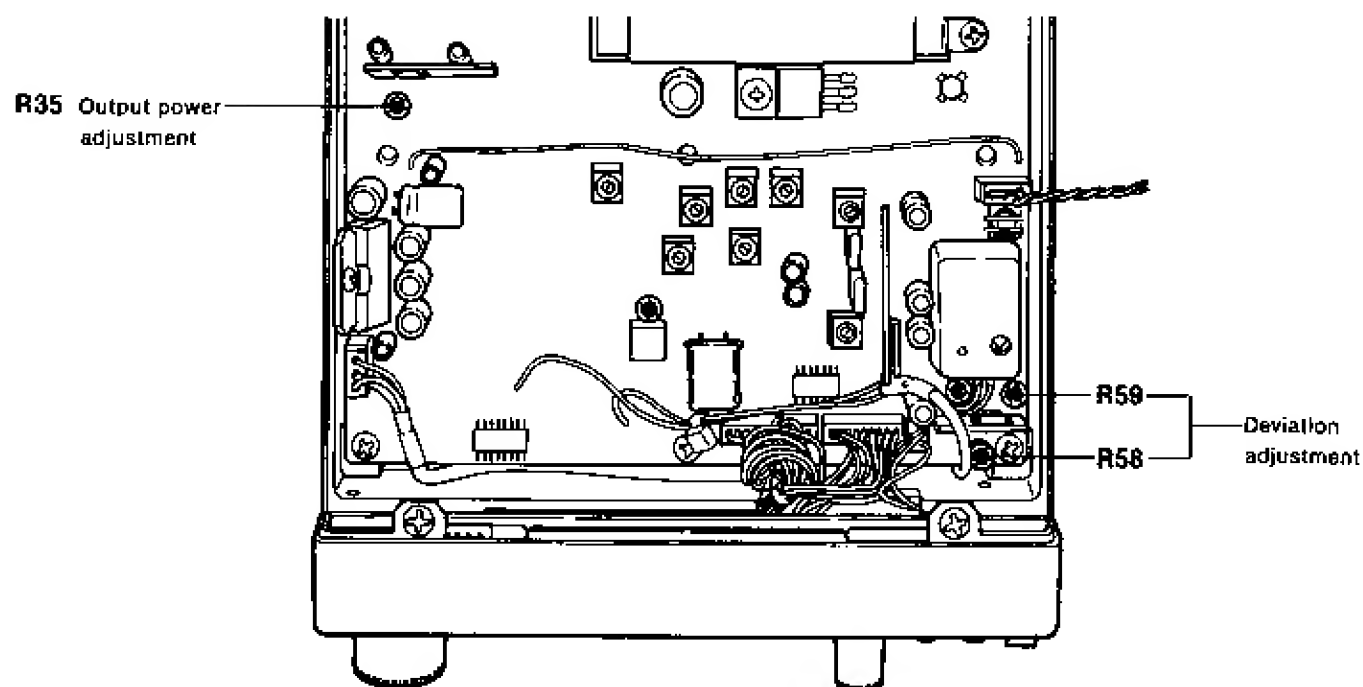
## 6-4 TRANSMITTER ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
OUTPUT POWER	1	• Displayed frequency: 445.0000 MHz (USA version) 435.0000 MHz (All other versions) • [HI/LO] switch : HI • Simplex • Transmitting	Rear panel	Connect the RF power meter to the [ANT] connector.	25 W (IC-3220A/E) 35 W (IC-3220H)	MAIN B	R45
	2	• SET mode : LPo-1 • [HI/LO] switch : LO			1 W (IC-3220A/E) 5 W (IC-3220H)		Verify
	3	• SET mode : LPo-2 • [HI/LO] switch : LO			10 W (IC-3220A/E/H)		
	4	Repeat steps 1, 2 and 3 several times.					
	5	• Displayed frequency: 146.0000 MHz (USA version) 145.0000 MHz (All other versions) • [HI/LO] switch : HI	Rear panel	Connect the RF power meter to the [ANT] connector.	25 W (IC-3220A/E) 45 W (IC-3220H)	MAIN A	R35
	6	• SET mode : LPo-1 • [HI/LO] switch : LO			1 W (IC-3220A/E) 5 W (IC-3220H)		Verify
	7	• SET mode : LPo-2 • [HI/LO] switch : LO			10 W (IC-3220A/E/H)		
	8	Repeat steps 5, 6 and 7 several times.					
DEVIATION	1	• Displayed frequency: 445.0000 MHz (USA version) 435.0000 MHz (All other versions) • [HI/LO] switch : HI • [T/T. SQL] switch : OFF • Connect the audio generator to the [MICROPHONE] connector and set as: 65 mV/1.0 kHz (USA version) 20 mV/1.0 kHz (All other versions) • Set the FM deviation meter as: HPF : 50 Hz LPF : 20 kHz De-emphasis : OFF Detector : (P-P)/2	Rear panel	Connect the FM deviation meter to the [ANT] connector via the attenuator.	± 4.8 kHz	MAIN A	R58
	2	• Displayed frequency: 146.0000 MHz (USA version) 145.0000 MHz (All other versions)					R59
TONE DEVIATION (USA only)	1	• Displayed frequency 445.0000 MHz • [T/T. SQL] switch : ON • Apply no signal to the [MICROPHONE] connector. • Set the tone frequency as: 88.5 Hz • Set the FM deviation meter as: HPF : OFF LPF : 20 kHz	Rear panel	Connect the FM deviation meter to the [ANT] connector via the attenuator.	± 0.8 kHz	MAIN B (TONE)	R5

• MAIN B UNIT



• MAIN A UNIT

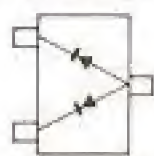




## BOARD LAYOUTS

## 7-1 LOGIC UNIT

**1SS181**  
(Symbol: A3)



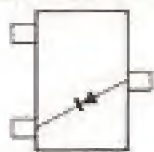
D1 (SEA, SEA-H), D9 (ITA, ITA-H), D10

**1SS187**  
(Symbol: D3)



D1 (EUR, EUR-H, USA, USA-H),  
D2 (EUR, EUR-H), D9 (USA, USA-H)

**1SS190**  
(Symbol: E3)



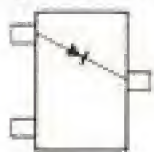
D1 (AUS, AUS-H), D2 (ITA, ITA-H)

**1SS193**  
(Symbol: F3)



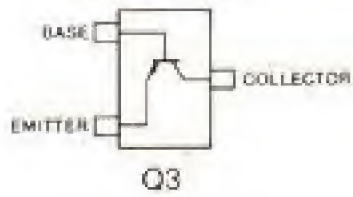
D8 (EUR, EUR-H, AUS, AUS-H),  
D11, D12, D14

**RD9.1M B2**  
(Symbol: 912)



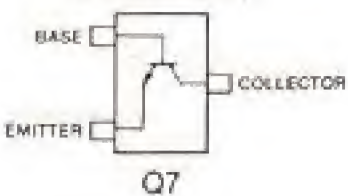
D13

**2SA1162 Y**  
(Symbol: SY)



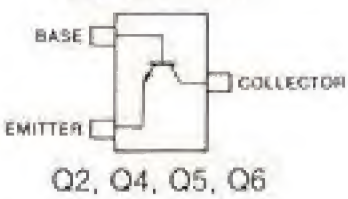
03

**2SC2712 GR**  
(Symbol: LG)



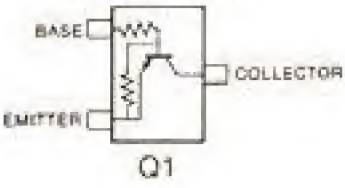
Q7

**2SC2712 Y**  
(Symbol: LY)

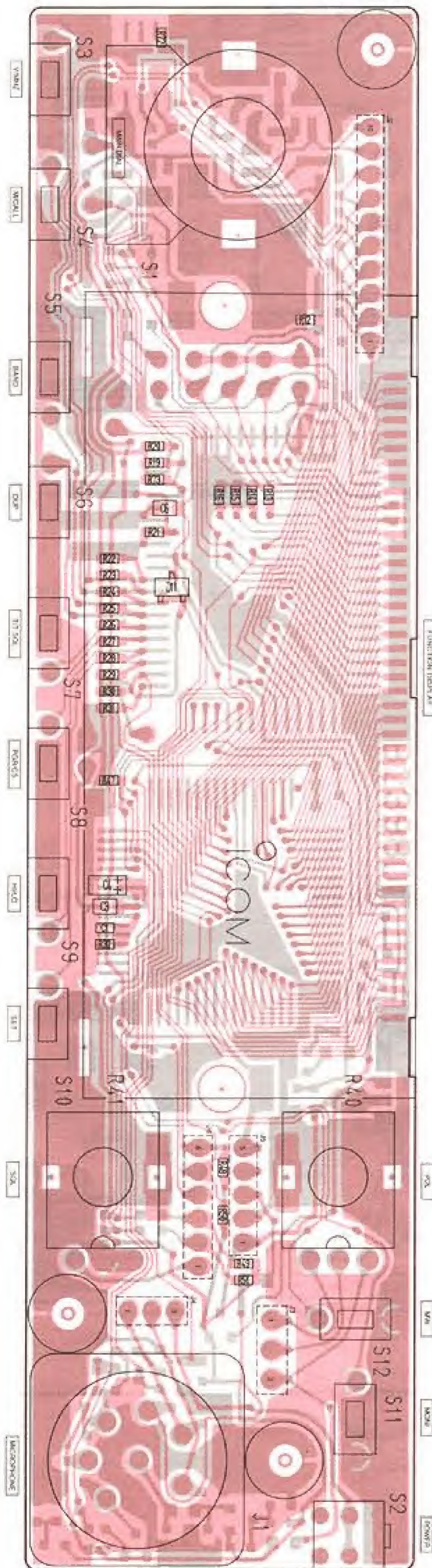


Q2, Q4, Q5, Q6

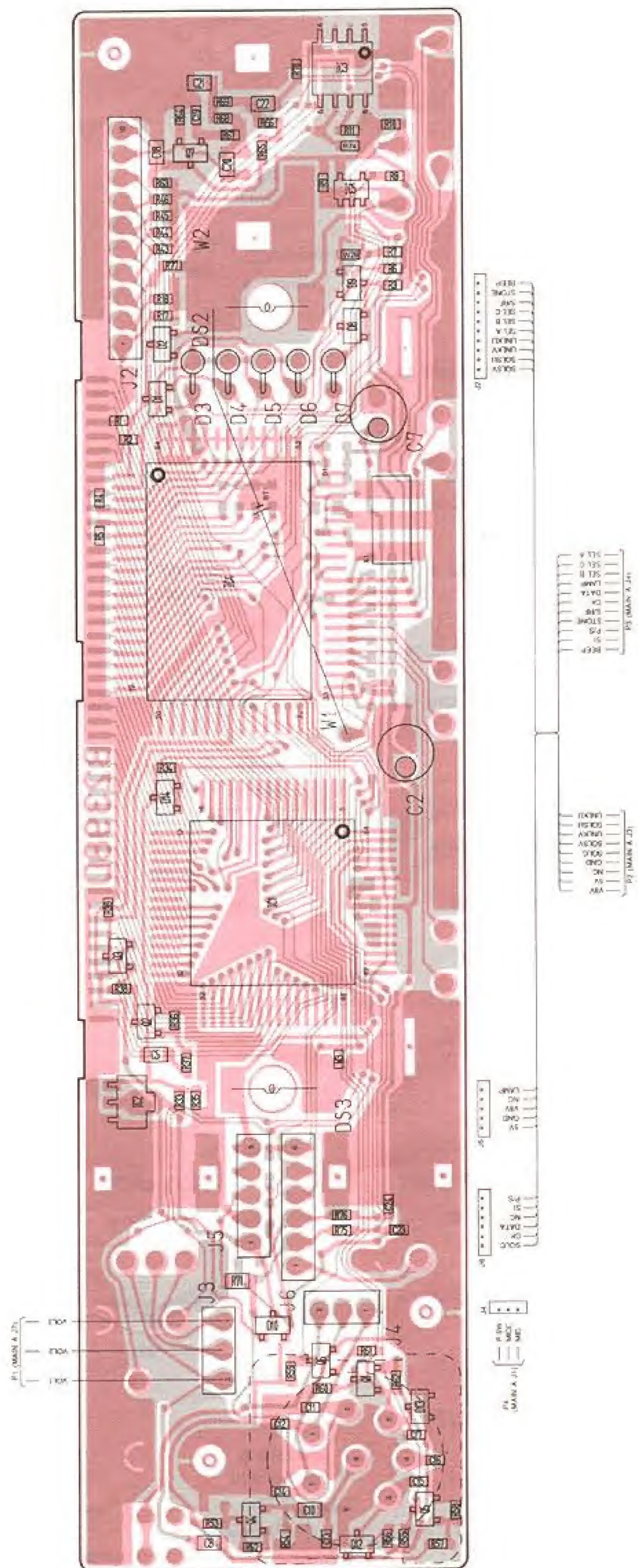
**RN2404**  
(Symbol: YD)



Q1



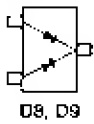




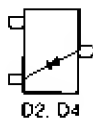
## 7-2 MAIN A AND SUBORDINATE (MAIN A) UNITS

### • MAIN A UNIT

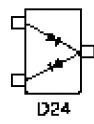
**1SS184**  
(Symbol: B3)



**1SS190**  
(Symbol: E3)



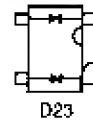
**1SS228**  
(Symbol: C3)



**H5MB3AS**  
(Symbol: C1)



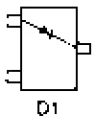
**MA159**  
(Symbol: M1A)



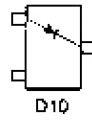
**MA582**  
(Symbol: M11)



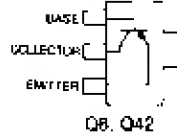
**RD20M B2**  
(Symbol: 202)



**RD6.2M B2**  
(Symbol: 622)



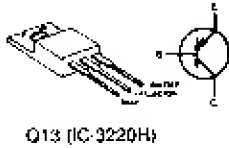
**2SA1734**  
(Symbol: LB)



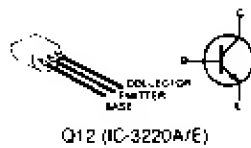
**2SB1143 S**



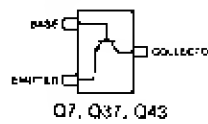
**2SB1135 R**



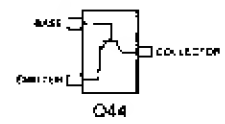
**2SC2407 (A)**



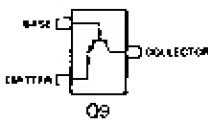
**2SC2712 Y**  
(Symbol: LY)



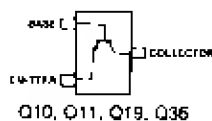
**2SC3326**  
(Symbol: CCB)



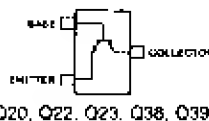
**2SC3881 TA**  
(Symbol: CP)



**2SC3772 3**  
(Symbol: LY3)



**2SC4081 S**  
(Symbol: BS)



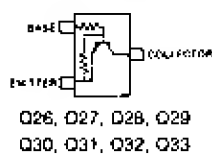
**2SJ108 Y**  
(Symbol: VY)



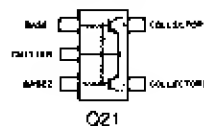
**3SK140 Y**  
(Symbol: UG)



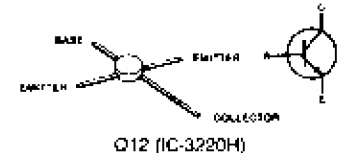
**DTC363EK**  
(Symbol: H27)



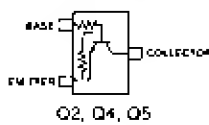
**FM02**  
(Symbol: G2)



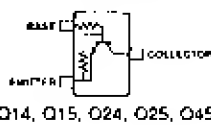
**MRF559**



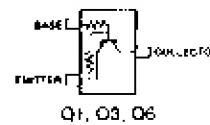
**RN1402**  
(Symbol: XB)



**RN1404**  
(Symbol: XD)



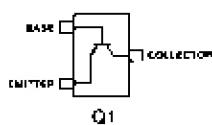
**RN2427**  
(Symbol: RG)



### • APC-A UNIT

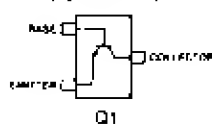
**2SC2712 Y** (IC-3220A/E)  
(Symbol: LY)

**2SC2712 GR** (IC-3220H)  
(Symbol: LG)



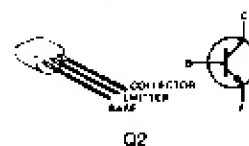
### • MIC-AMP UNIT

**2SC4116 GR**  
(Symbol: LG)

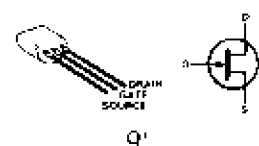


### • V-VCO UNIT

**2SC3776-D**



**2SK125**



### • V-PLL UNIT

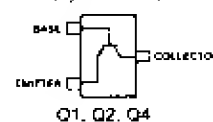
**DA114**  
(Symbol: AV)



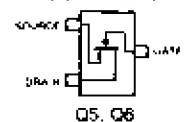
**2SA1578 R**  
(Symbol: FR)



**2SC4081 R**  
(Symbol: BR)



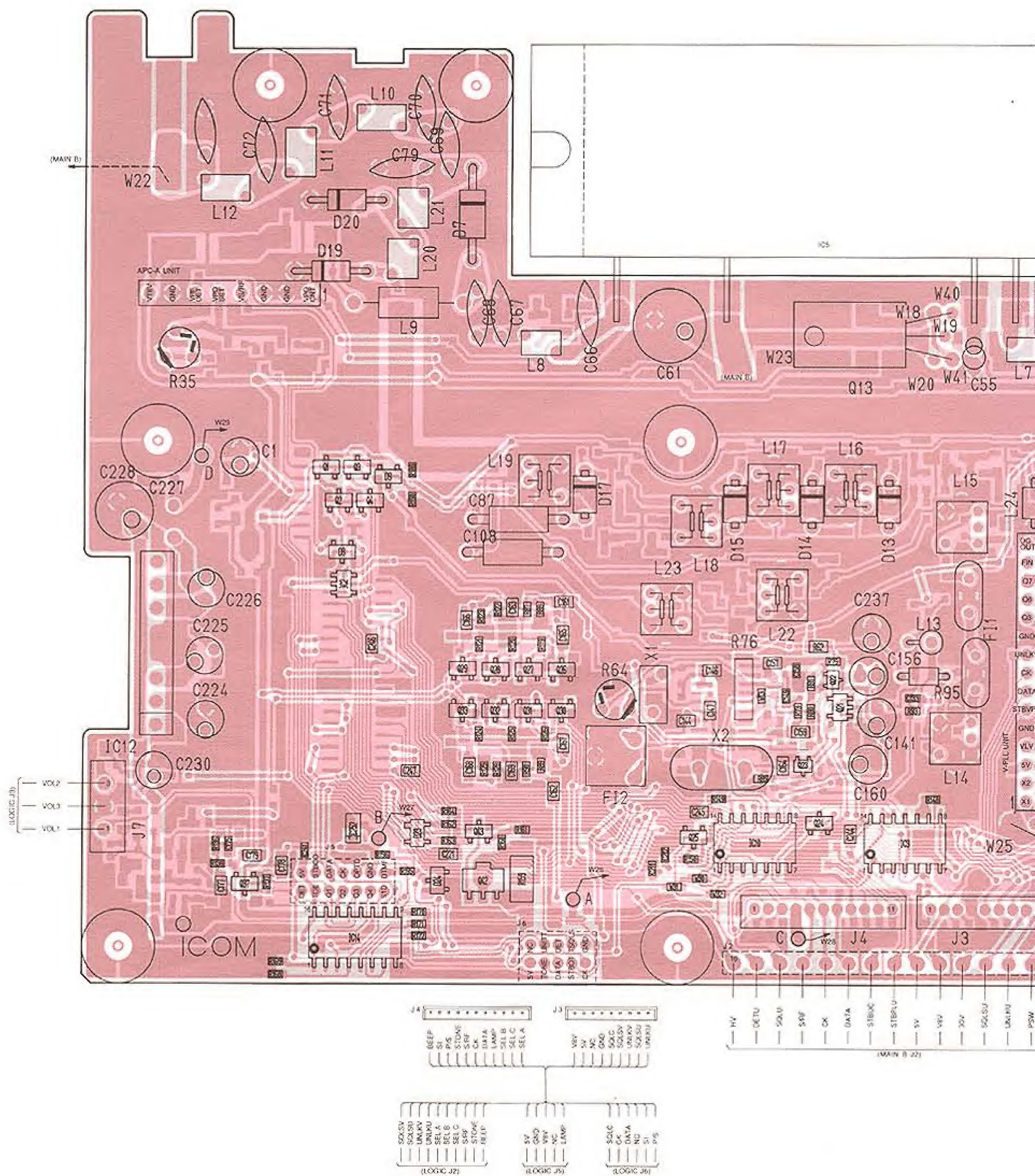
**2SK209 Y**  
(Symbol: XY)





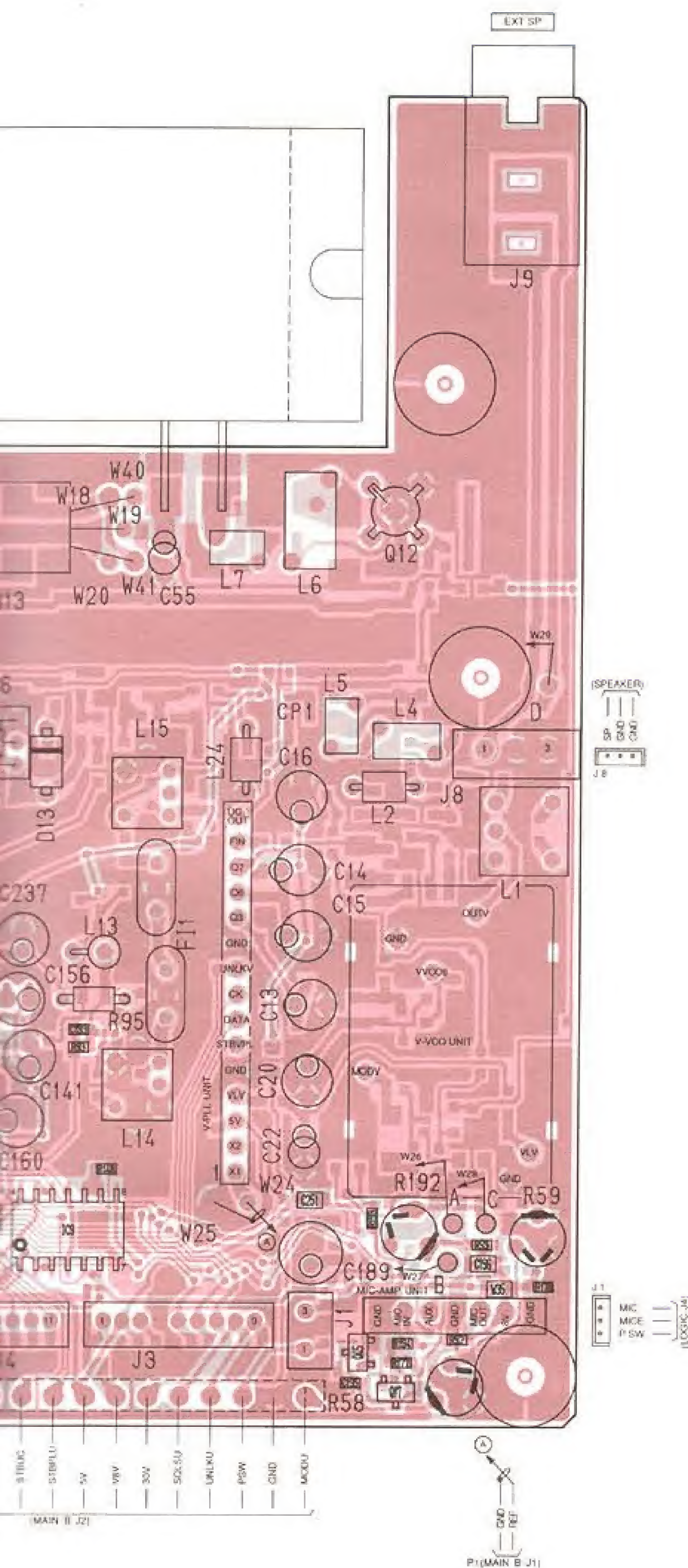
• MAIN A UNIT (TOP VIEW)

The combination of this page and the ne  
the unit layout in the same configuratio  
P.C. Board.

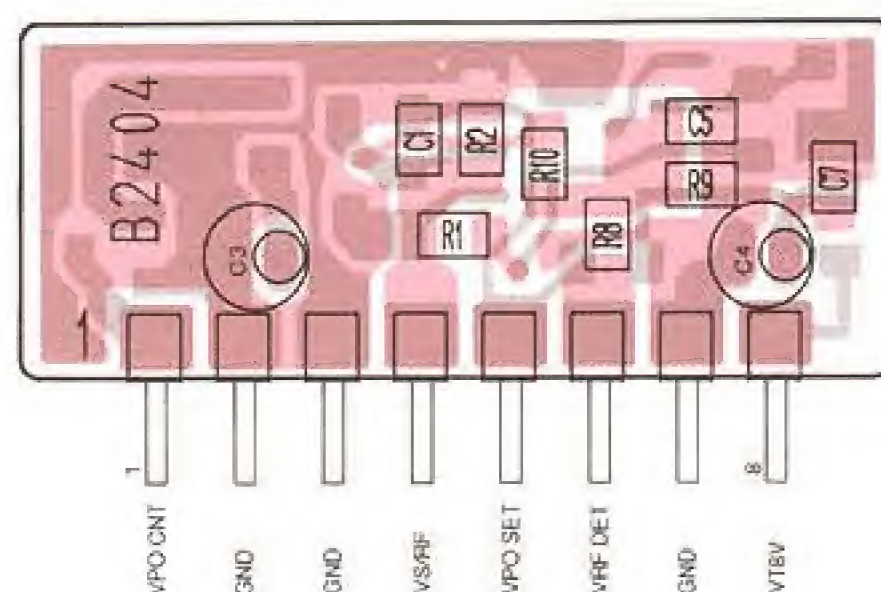




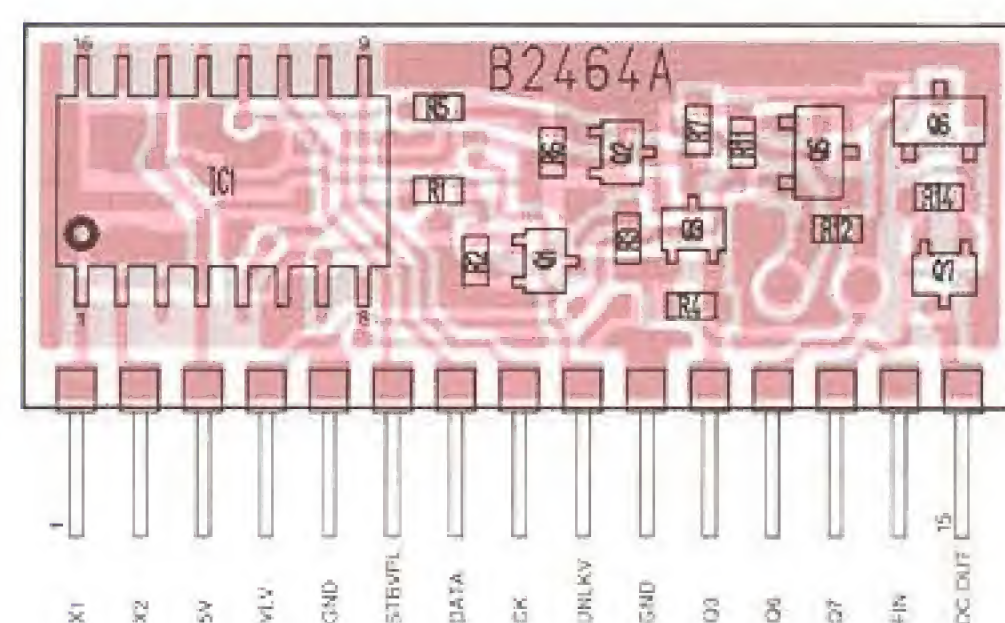
on of this page and the next page shows  
in the same configuration as the actual



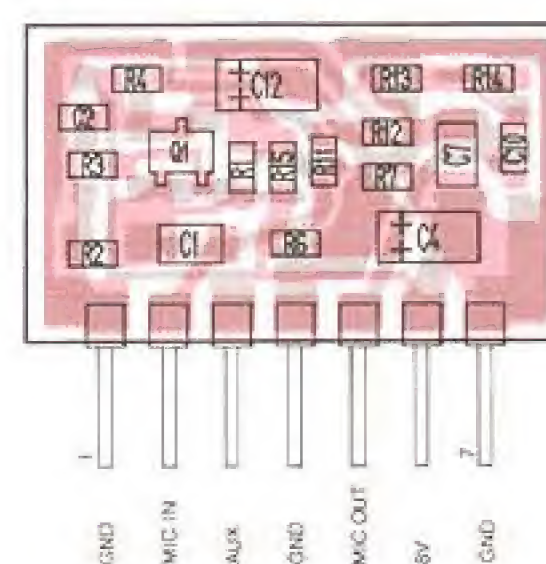
- APC-A UNIT



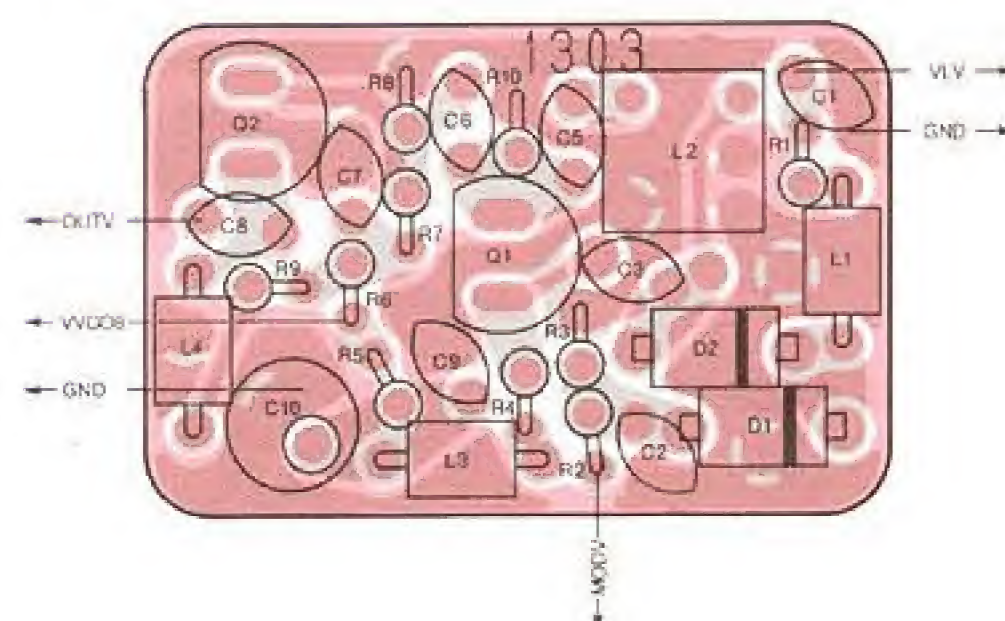
- V-PLL UNIT



- MIC-AMP UNIT

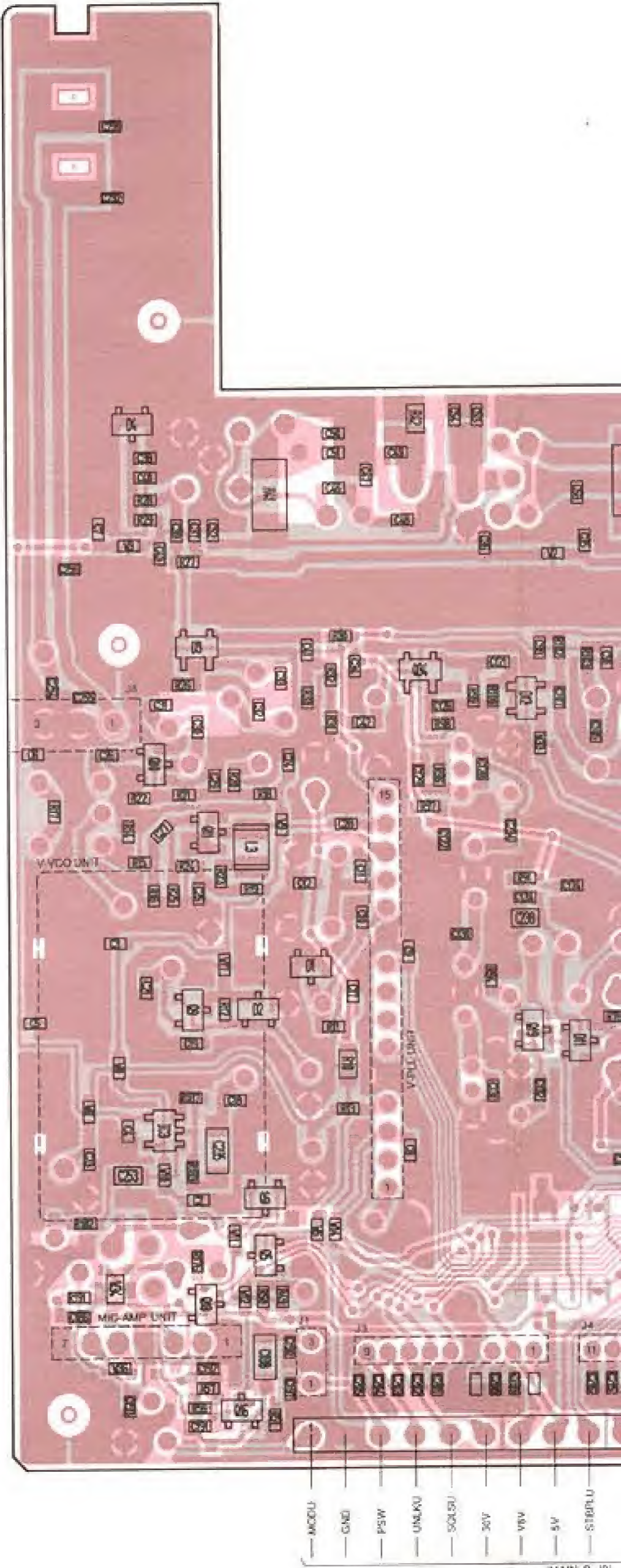


- V-VCO UNIT

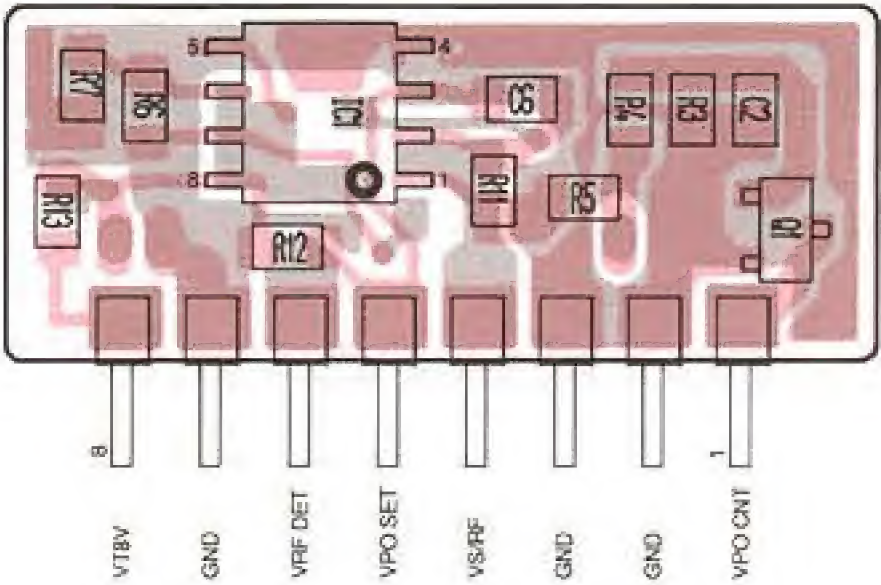




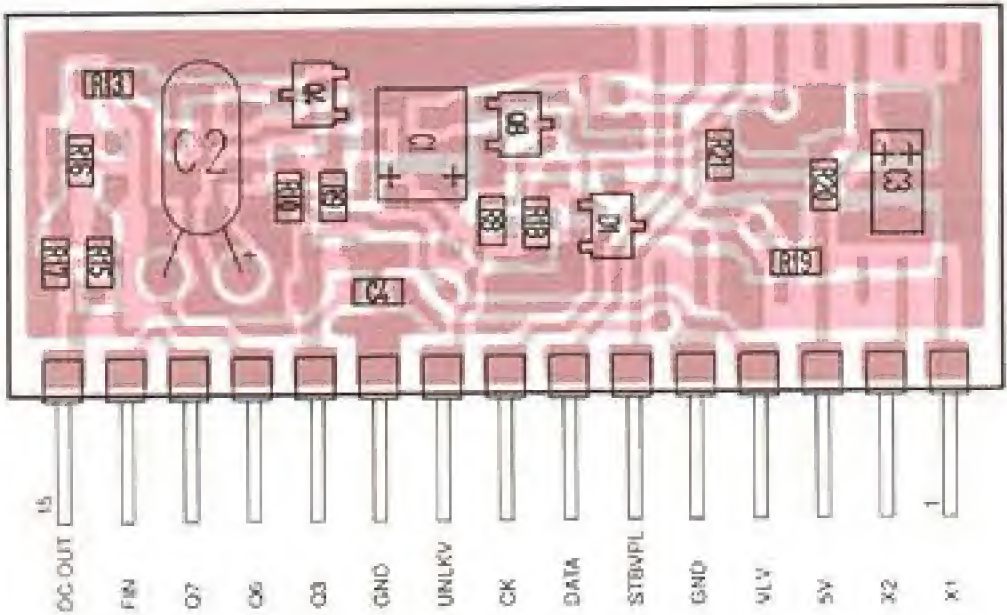
• MAIN A UNIT (BOTTOM VIEW)



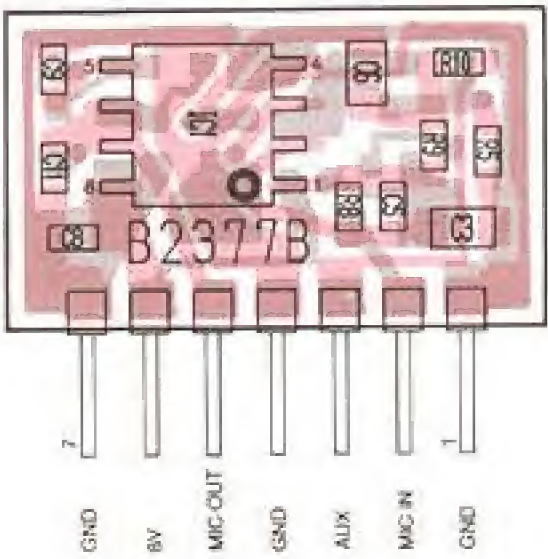
• APC-A UNIT



• V-PLL UNIT



• MIC-AMP UNIT





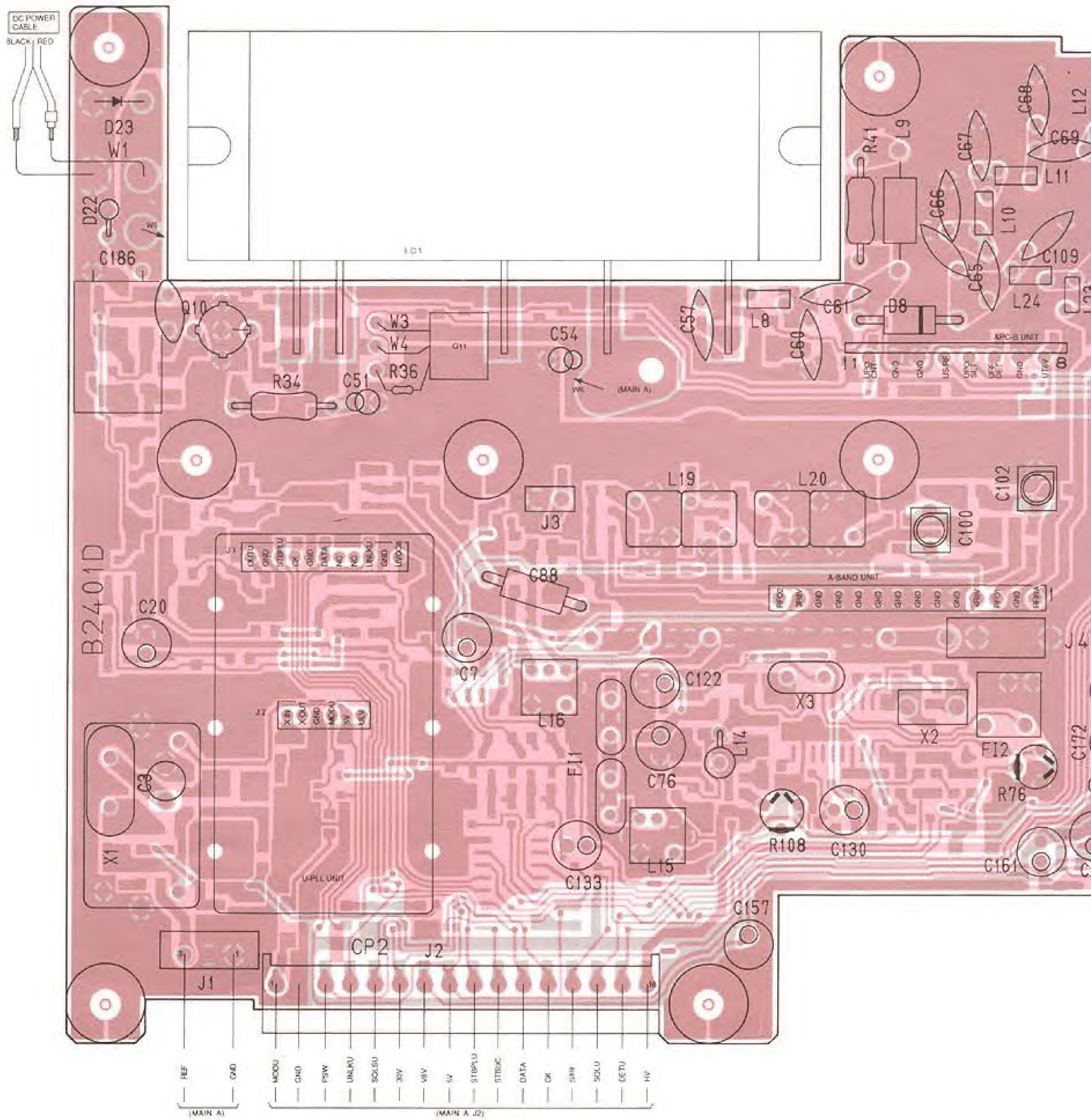




7-3 MAIN B AND SUBORDINATE (MAIN B) UNITS

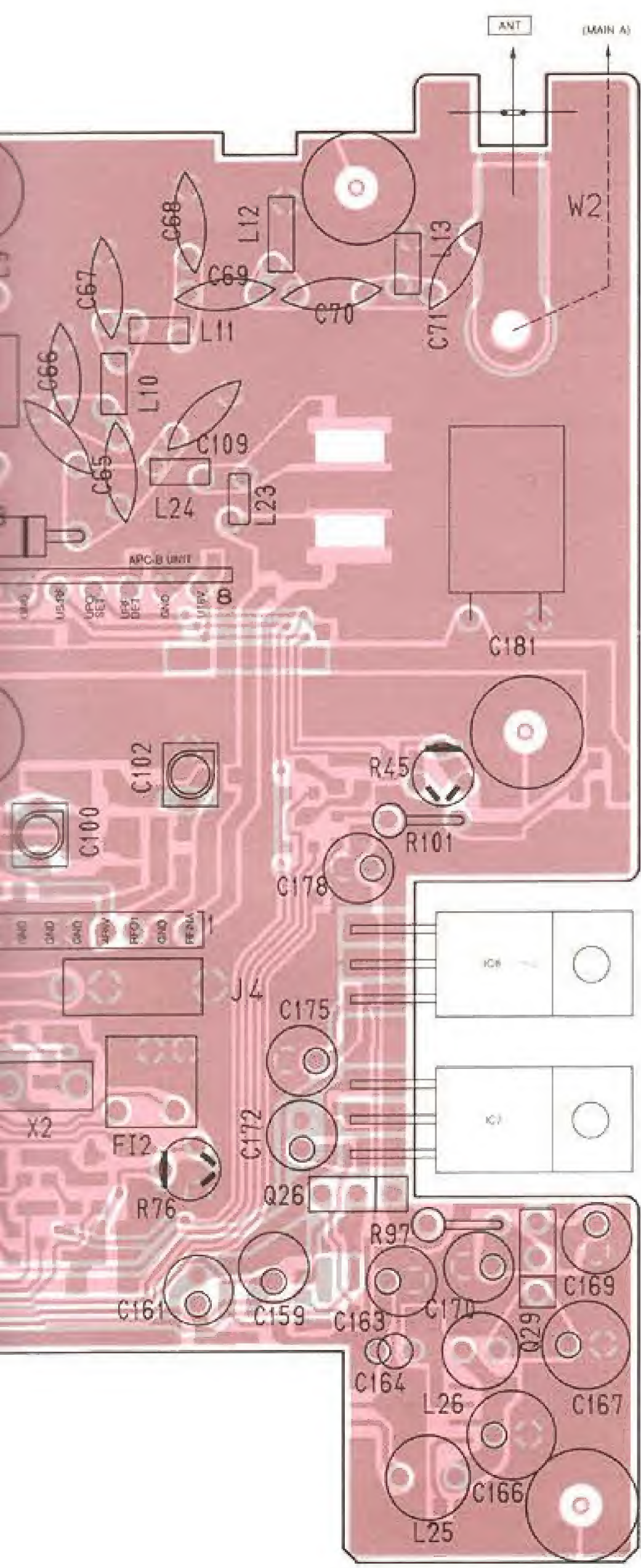
• MAIN B UNIT (TOP VIEW)

The combination of this page and the unit layout in the same configuration P.C. Board.

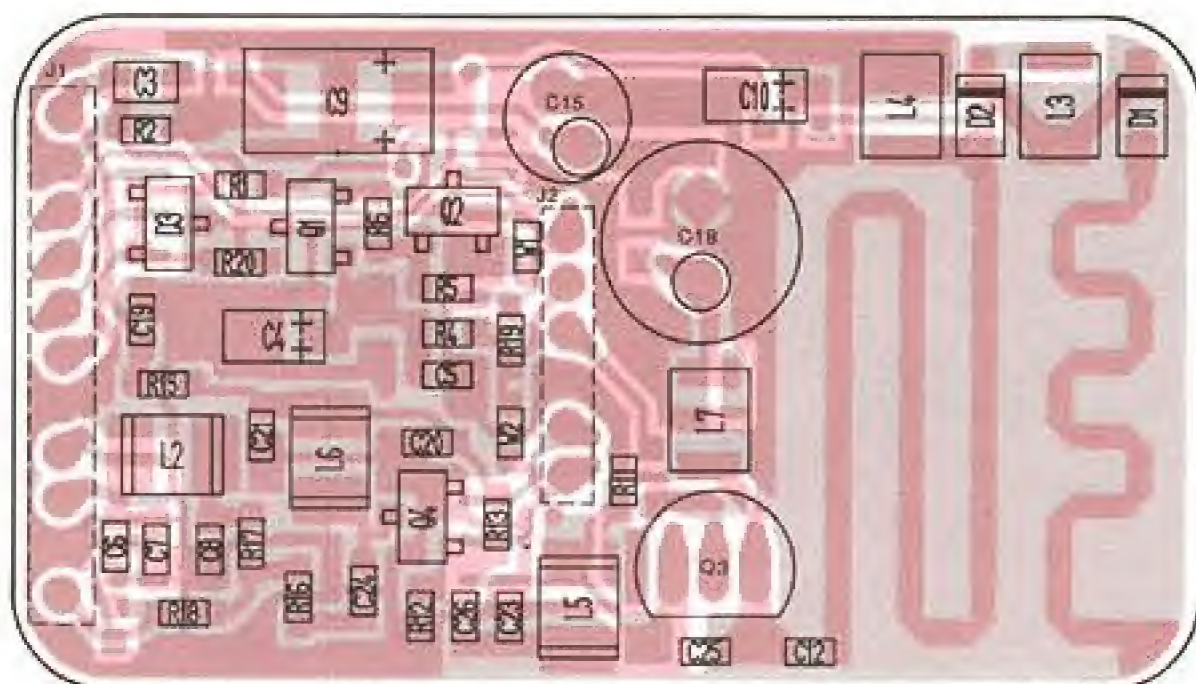




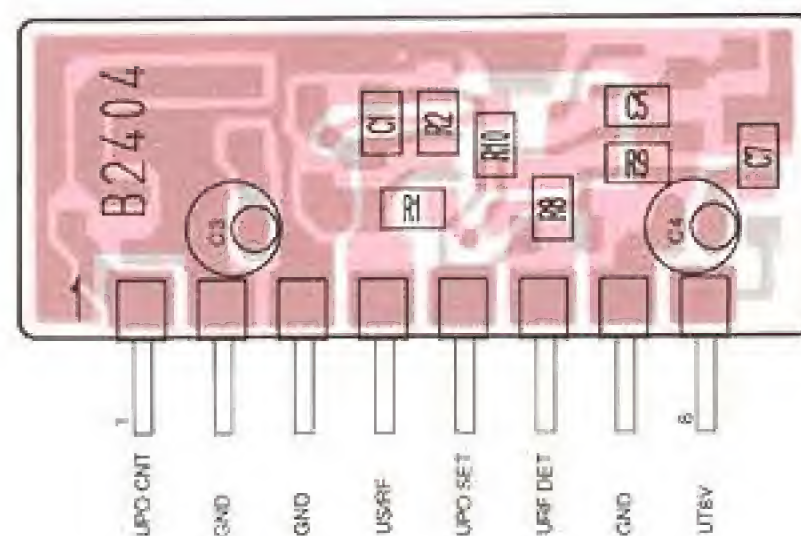
ation of this page and the next page shows  
out in the same configuration as the actual



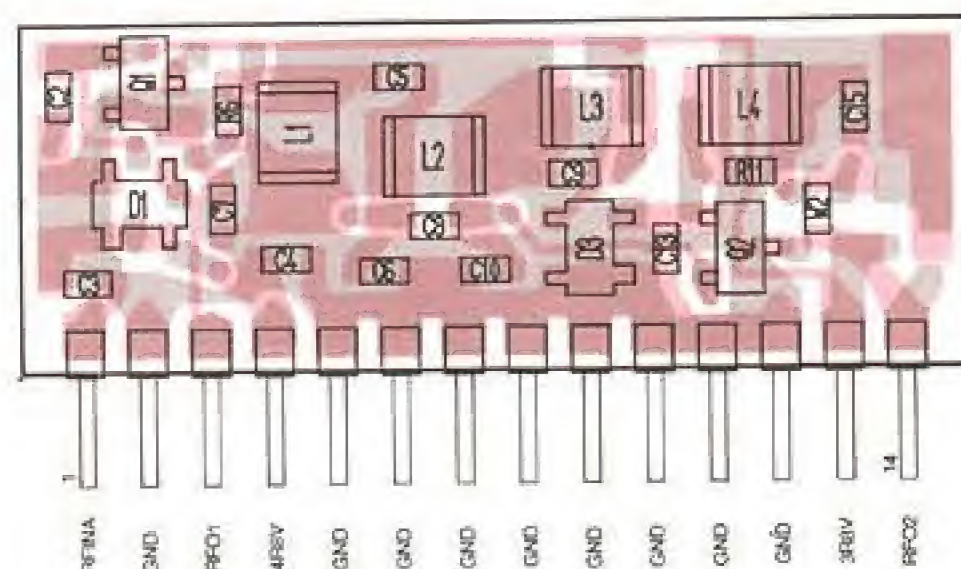
# • U-PLL UNIT



# • APC-B UNIT



# • A-BAND UNIT

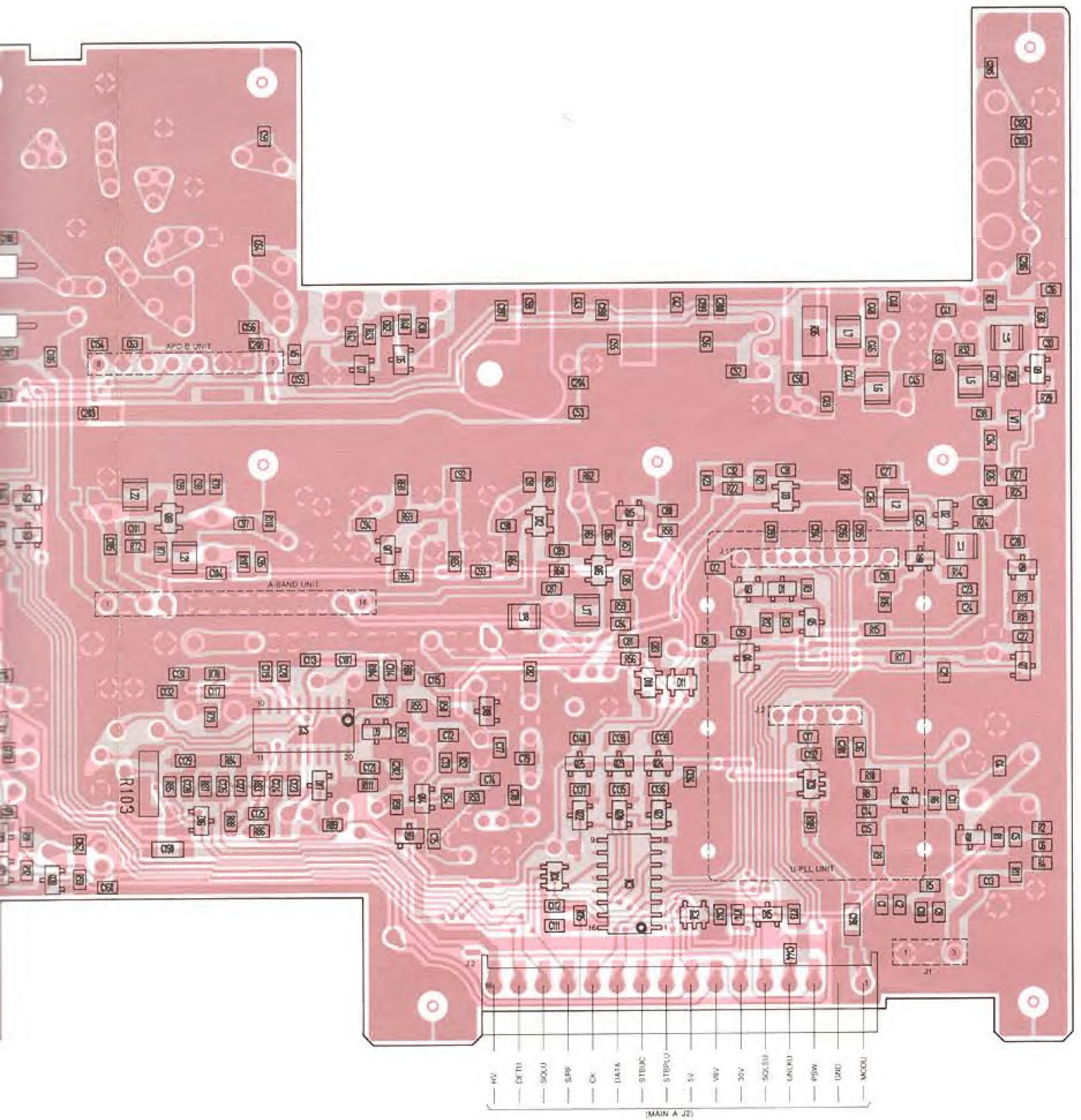








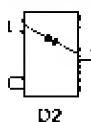
VIEW)





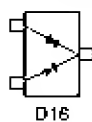
## • MAIN B UNIT

**1SS153**  
(Symbol: A9)



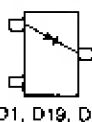
D2

**1SS154**  
(Symbol: B3)



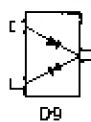
D16

**1SS193**  
(Symbol: F3)



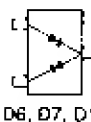
D1, D19, D21

**1SS226**  
(Symbol: C3)



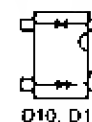
D9

**HSM88AS**  
(Symbol: C1)



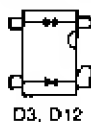
D6, D7, D17

**MA159**  
(Symbol: M1A)



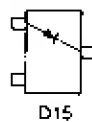
D10, D11

**MA962**  
(Symbol: M11)



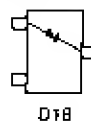
D3, D12

**RD15M B2**  
(Symbol: 152)



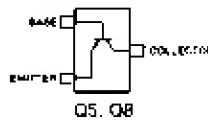
D15

**RD6.2M B2**  
(Symbol: 622)



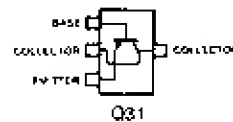
D18

**2SA1302 GR**  
(Symbol: AEG)



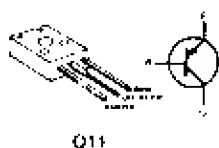
Q5, Q8

**2SA1738**  
(Symbol: LD)



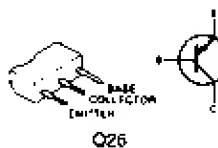
Q31

**2SB1143 S**



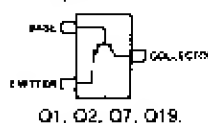
Q11

**2SB909M R**



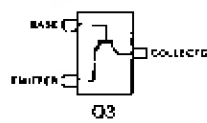
Q26

**2SC2712 Y**  
(Symbol: LY)



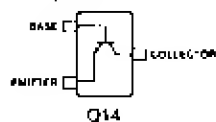
Q1, Q2, Q7, Q19,  
Q27, Q28

**2SC3061 TA**  
(Symbol: CP)



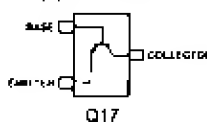
Q3

**2SC3770 3**  
(Symbol: JY3)



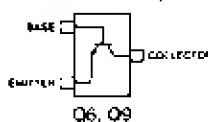
Q14

**2SC3772 3**  
(Symbol: LY3)



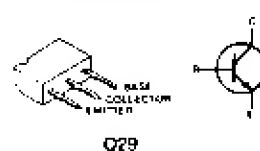
Q17

**2SC3775 3**  
(Symbol: QY3)



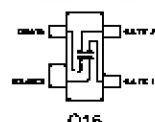
Q6, Q9

**2SD1225M R**



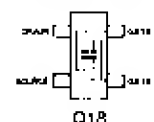
Q29

**3SK140 Y**  
(Symbol: UG)



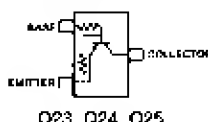
Q16

**3SK177 U73**  
(Symbol: U73)



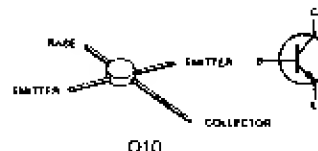
Q18

**DTB123EK**  
(Symbol: F12)



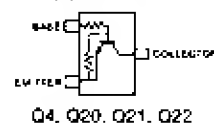
Q23, Q24, Q25

**MRF550**



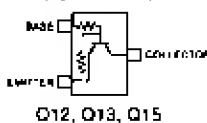
Q10

**RN1402**  
(Symbol: XB)



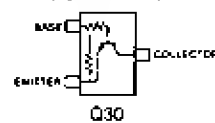
Q4, Q20, Q21, Q22

**RN1404**  
(Symbol: XD)



Q12, Q13, Q15

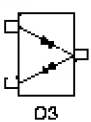
**RN2427**  
(Symbol: RG)



Q30

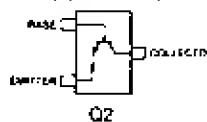
## • U-PLL UNIT

**HSM88AS**  
(Symbol: C1)



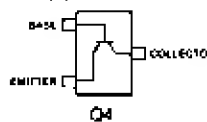
D3

**2SC2712 GR**  
(Symbol: LG)



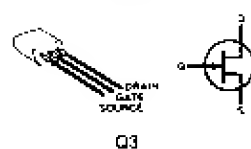
Q2

**2SC3772 3**  
(Symbol: LY3)



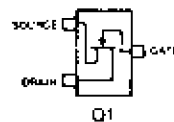
Q4

**2SK125**



Q3

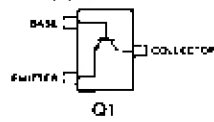
**2SK209 Y**  
(Symbol: XY)



Q1

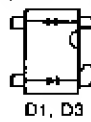
## • APC-B UNIT

**2SC2712 Y**  
(Symbol: LY)



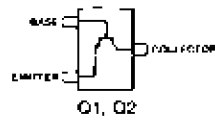
Q1

**MA962**  
(Symbol: M11)



D1, D3

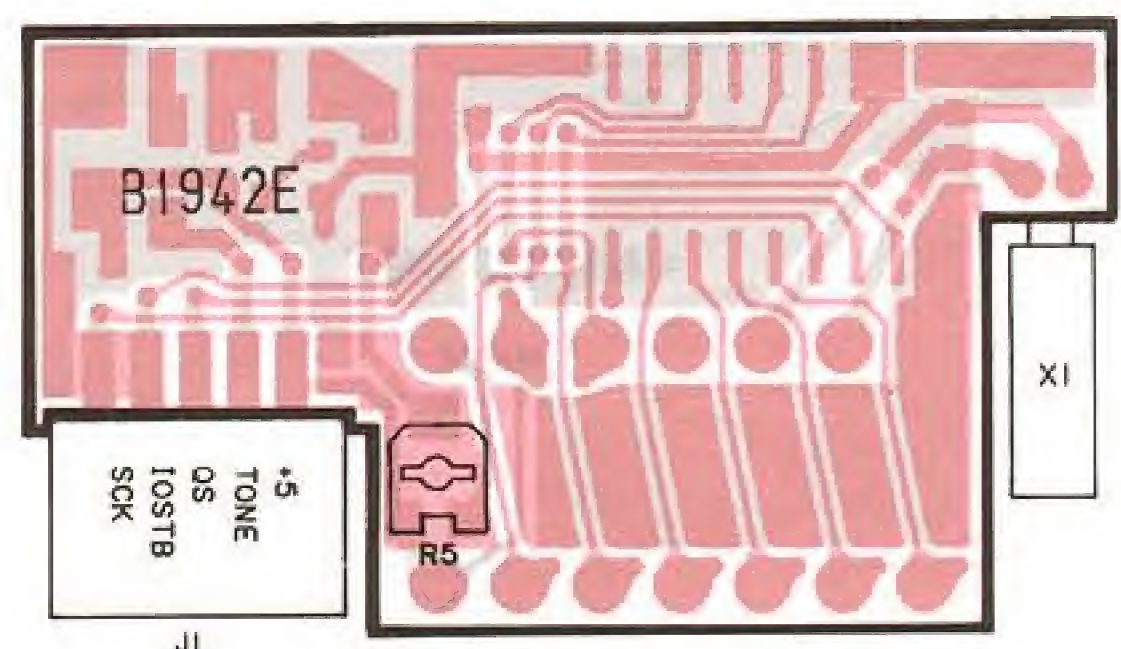
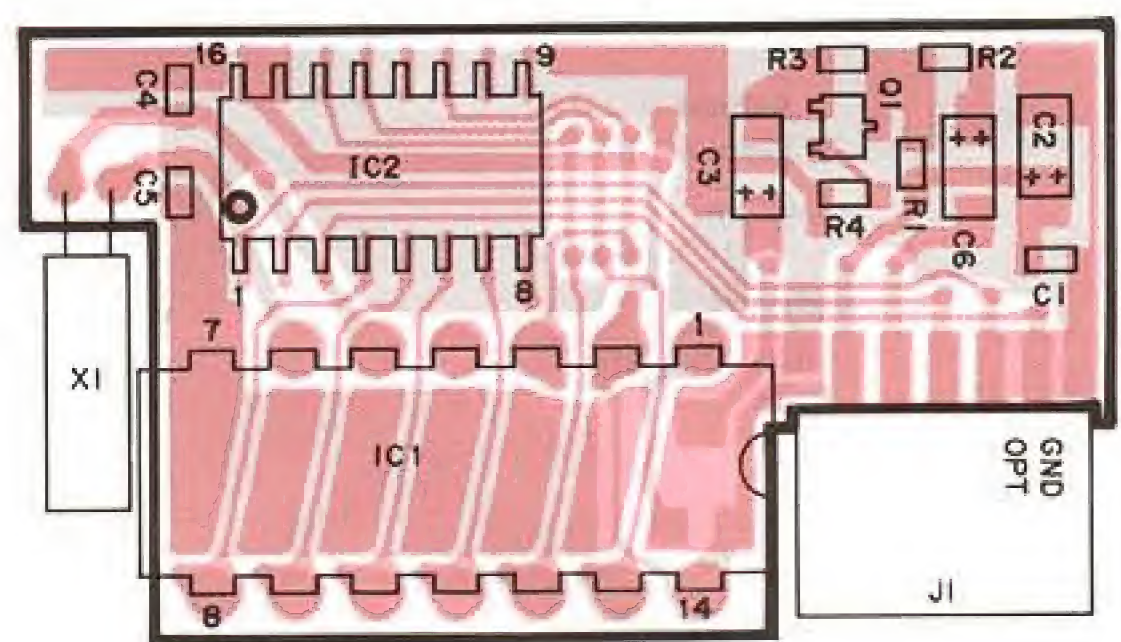
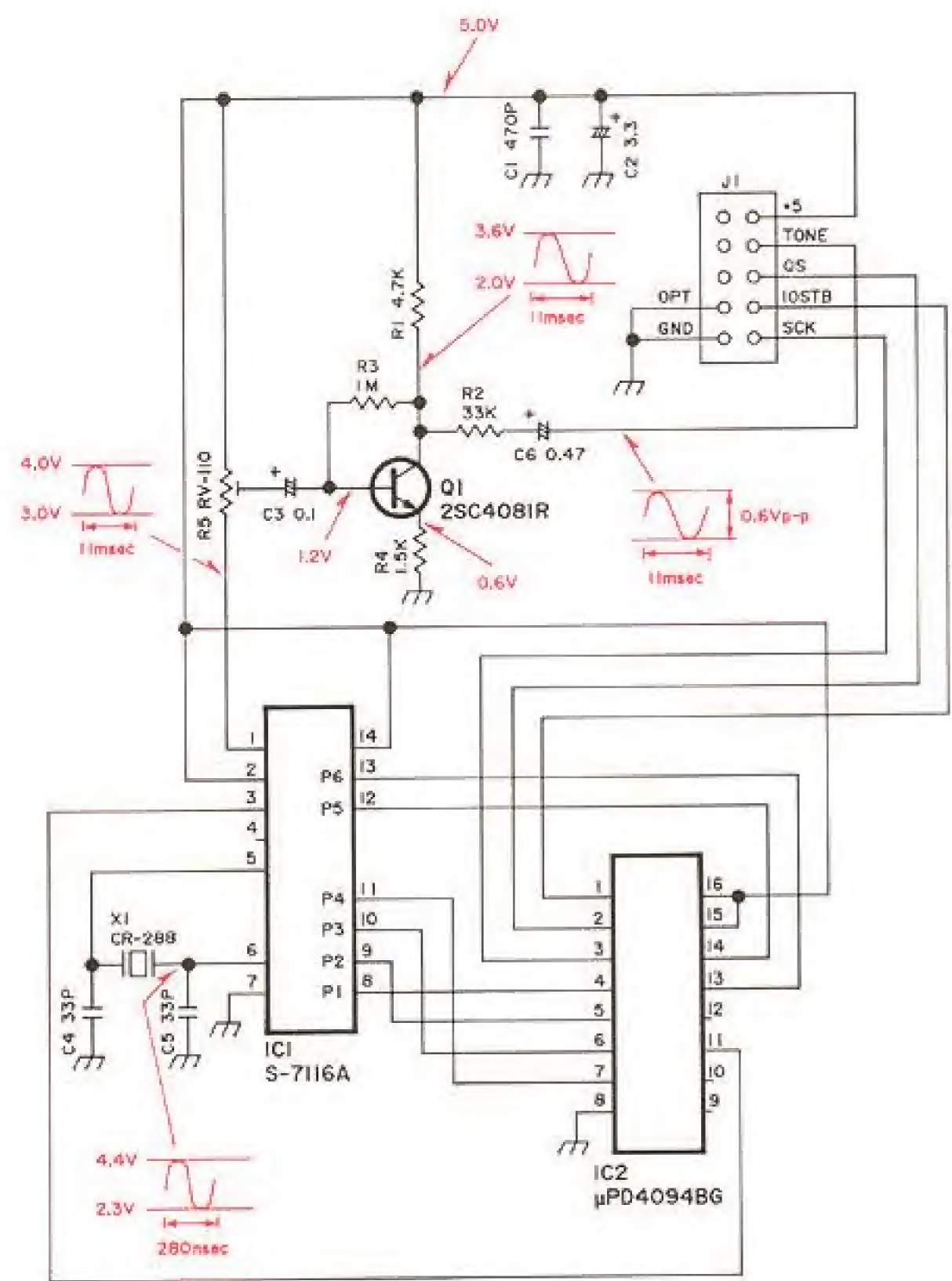
**2SC3772 3**  
(Symbol: LY3)



Q1, Q2

## • A-BAND UNIT

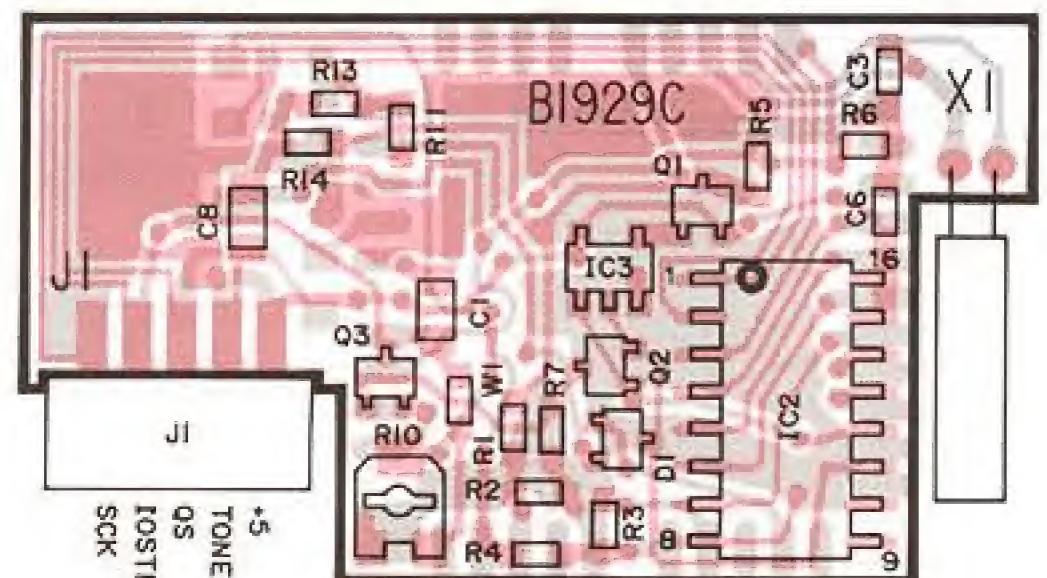
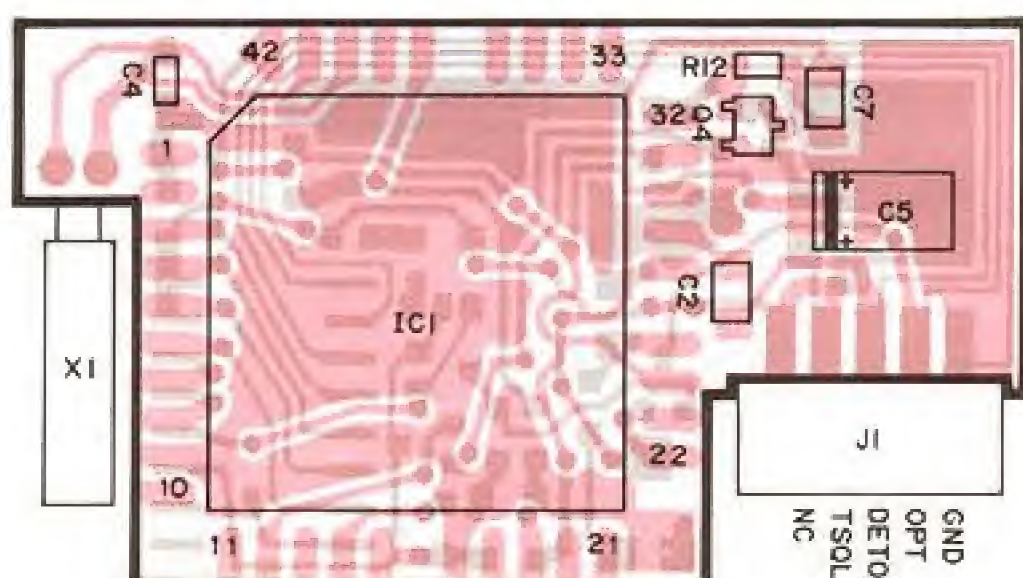
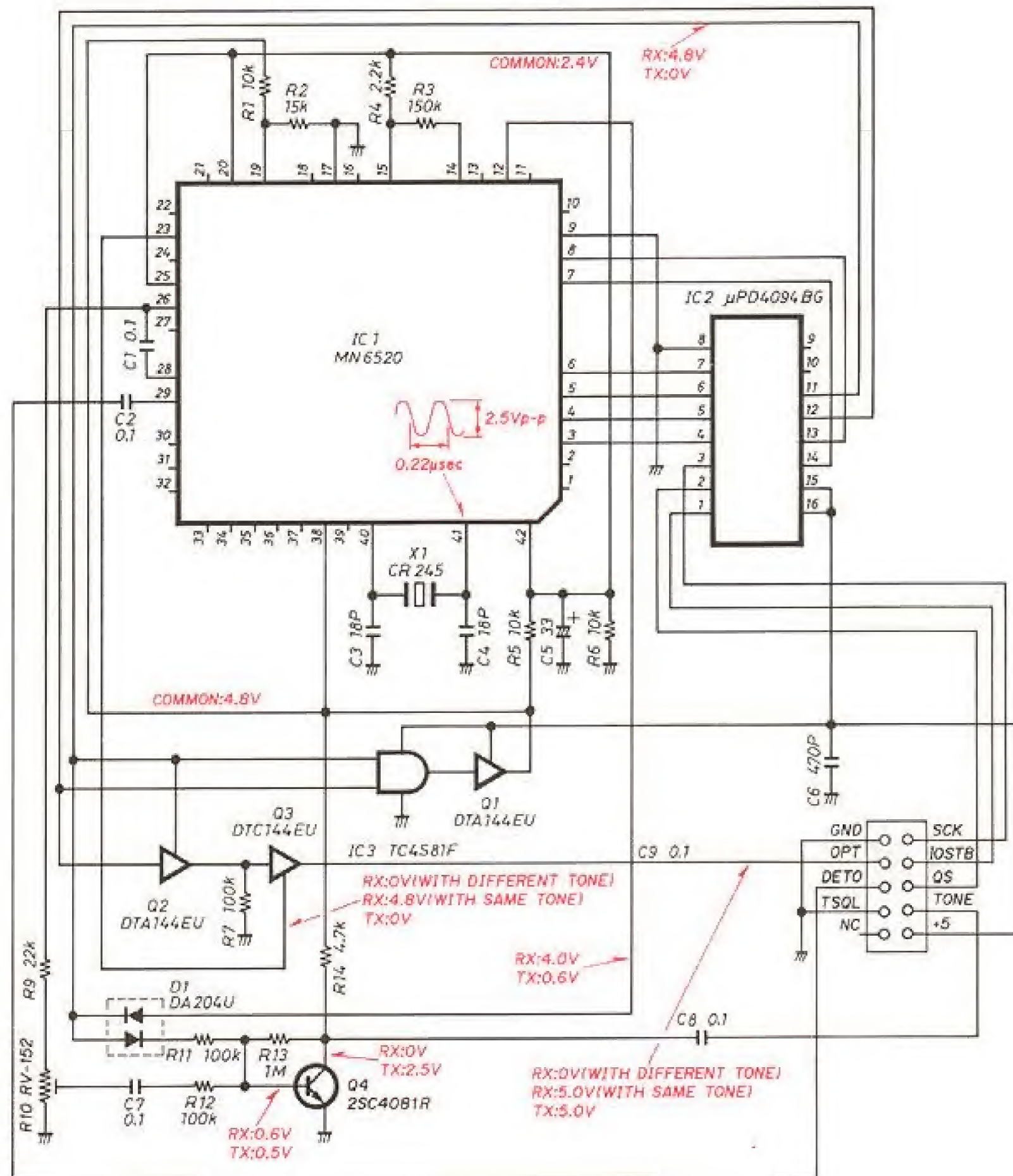
7-4 UT-51 PROGRAMMABLE TONE ENCODER UNIT (U.S.A. version only)





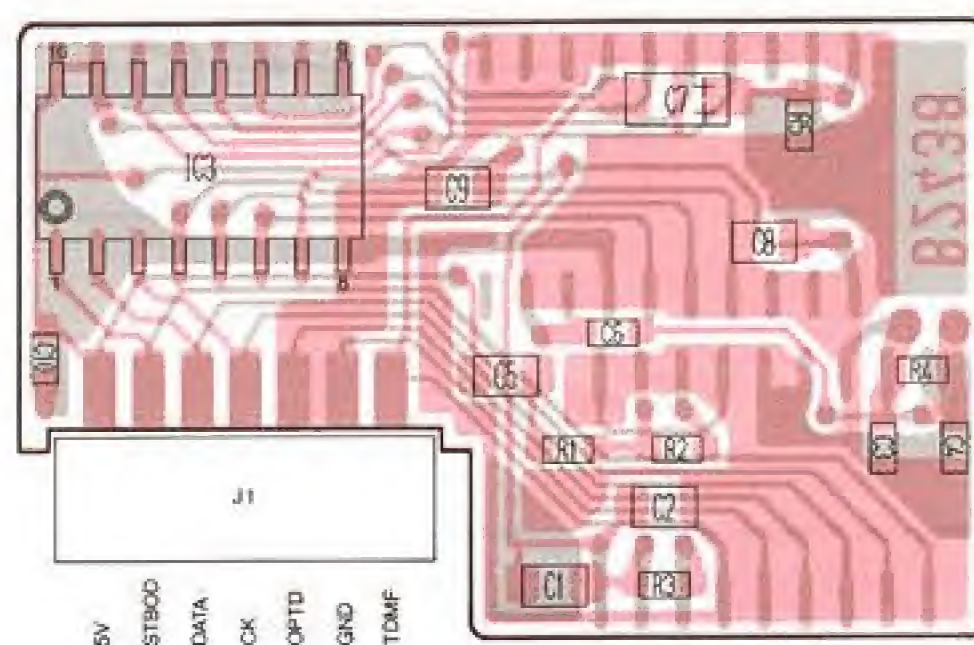
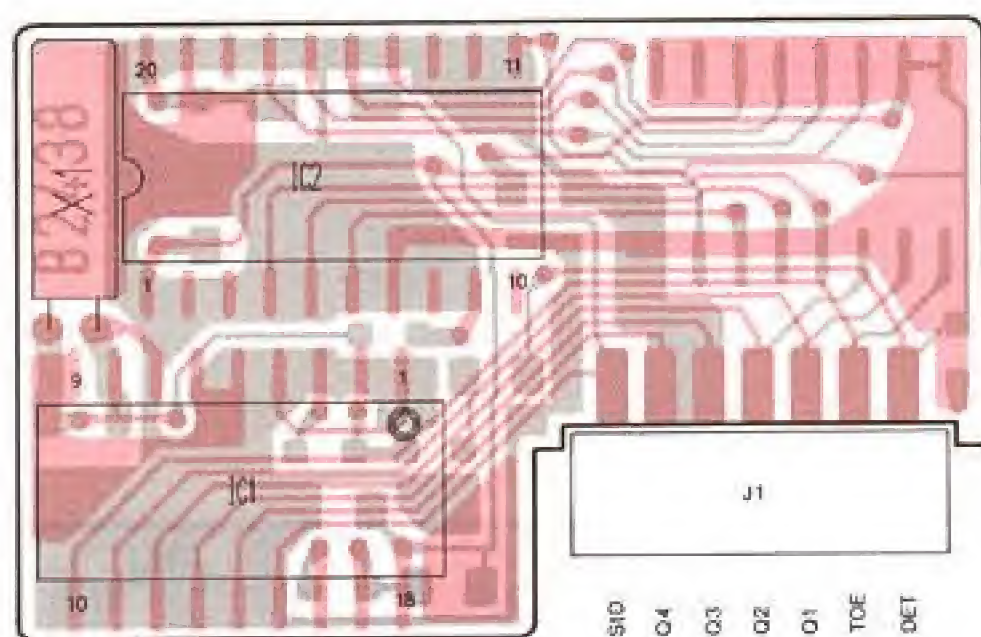
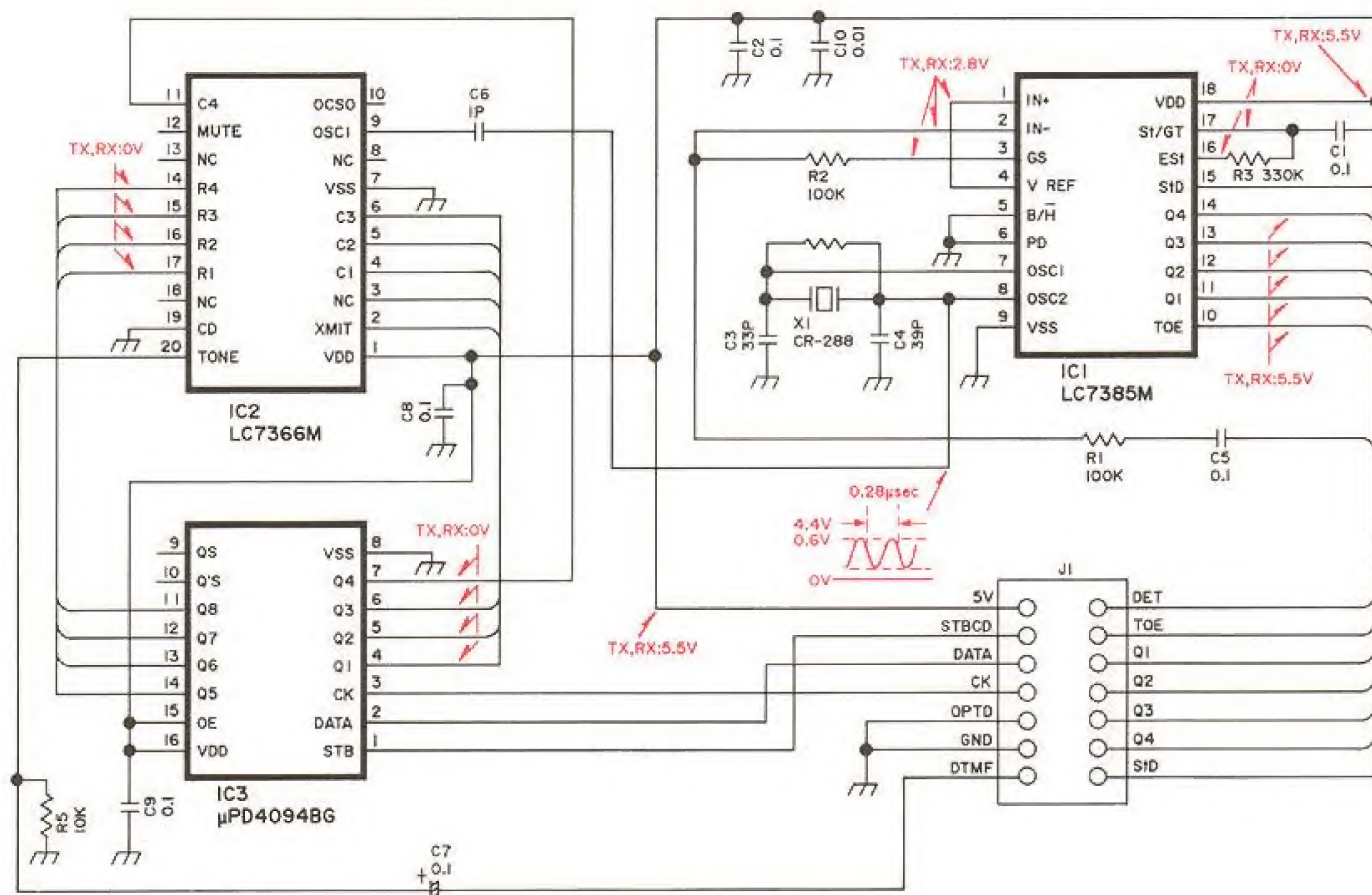
## SECTION 8 OPTIONAL UNITS

### 8-1 UT-50 TONE SQUELCH UNIT

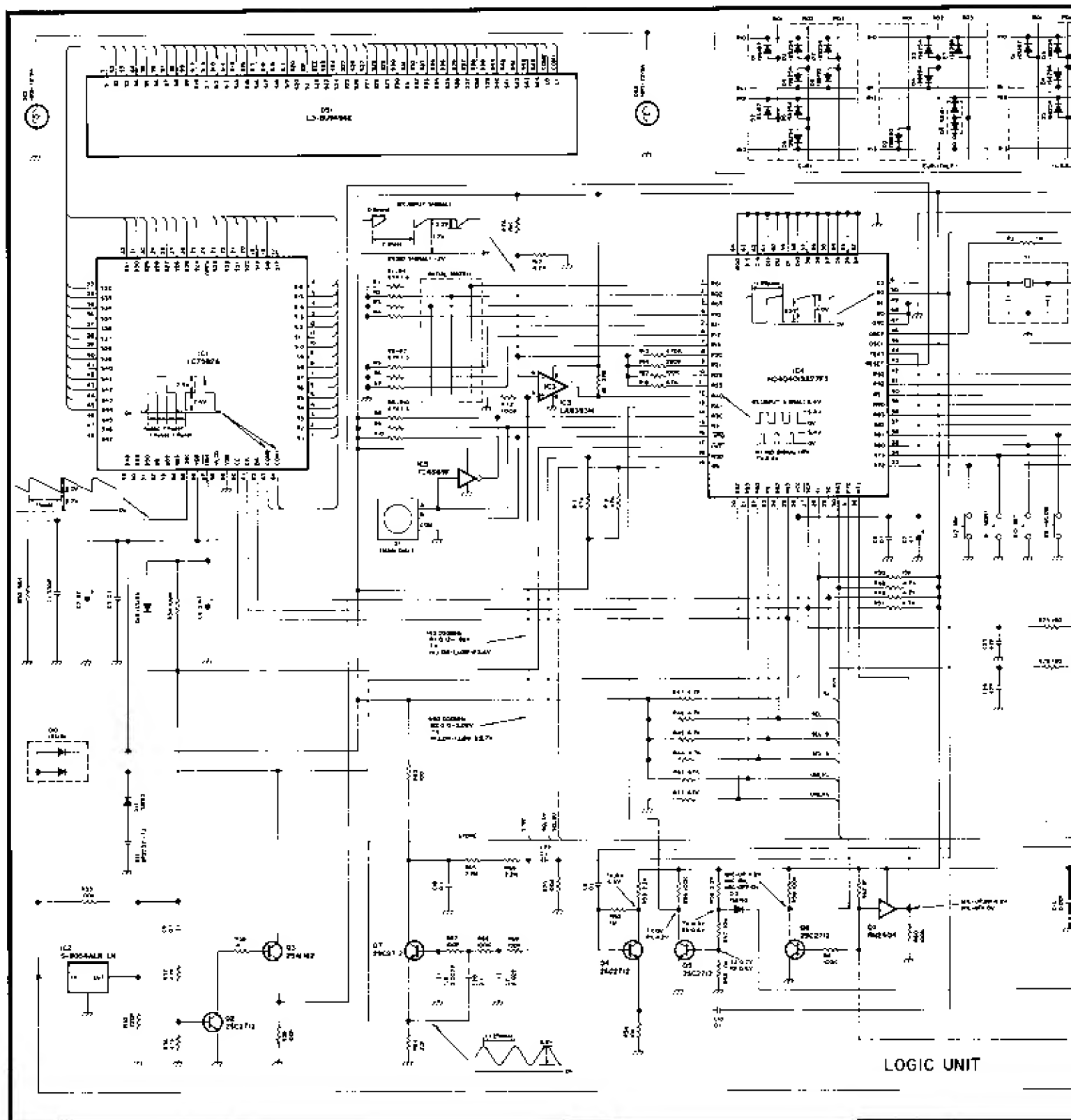




## 8-2 UT-55 DTMF ENCODER/DECODER UNIT

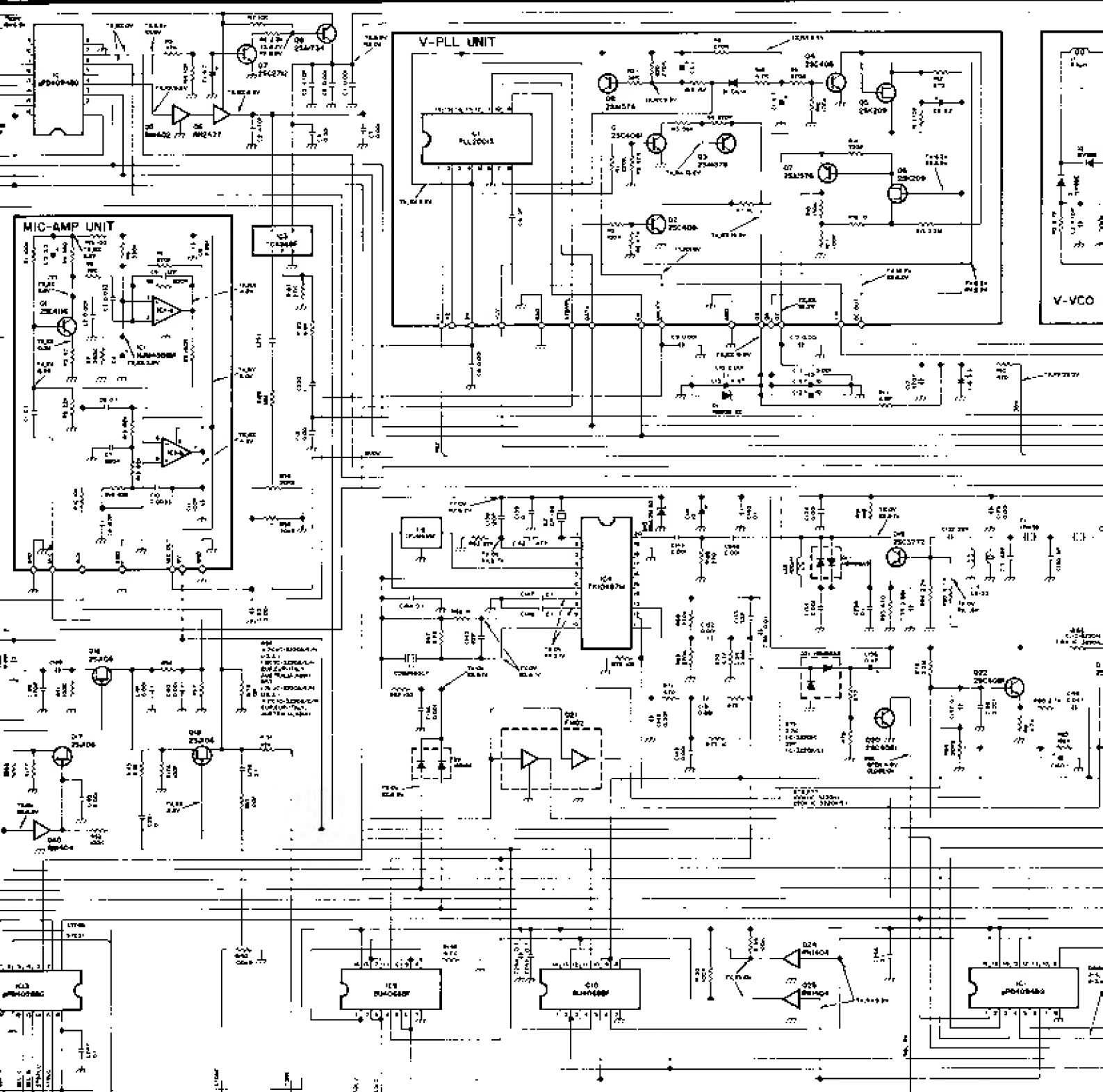


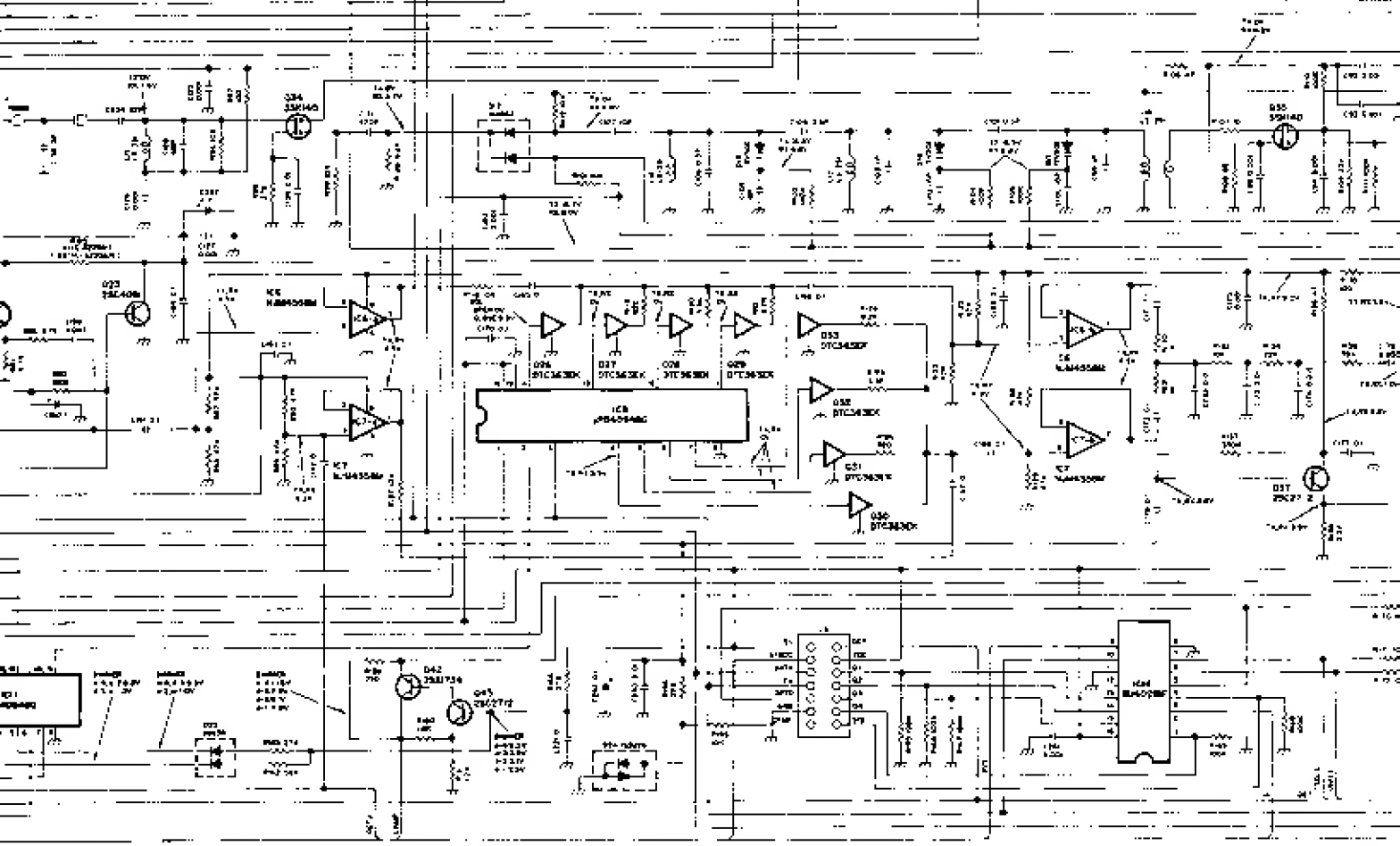
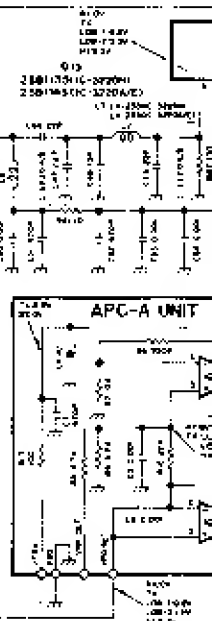
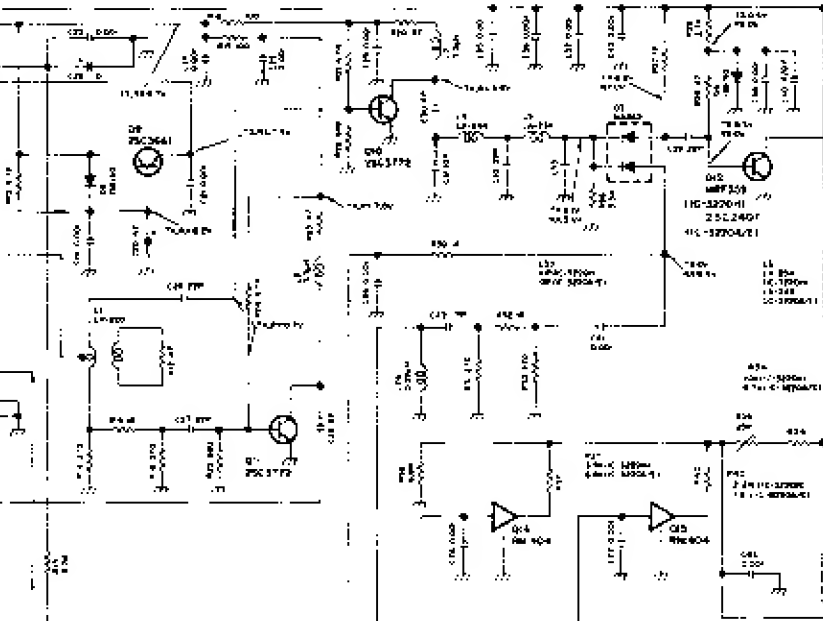
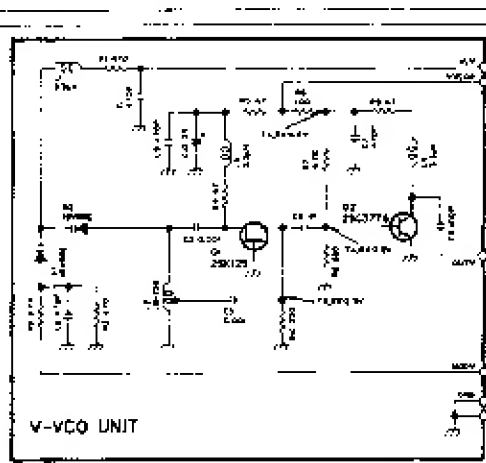
## SECTION 9 VOLTAGE DIAGRAMS

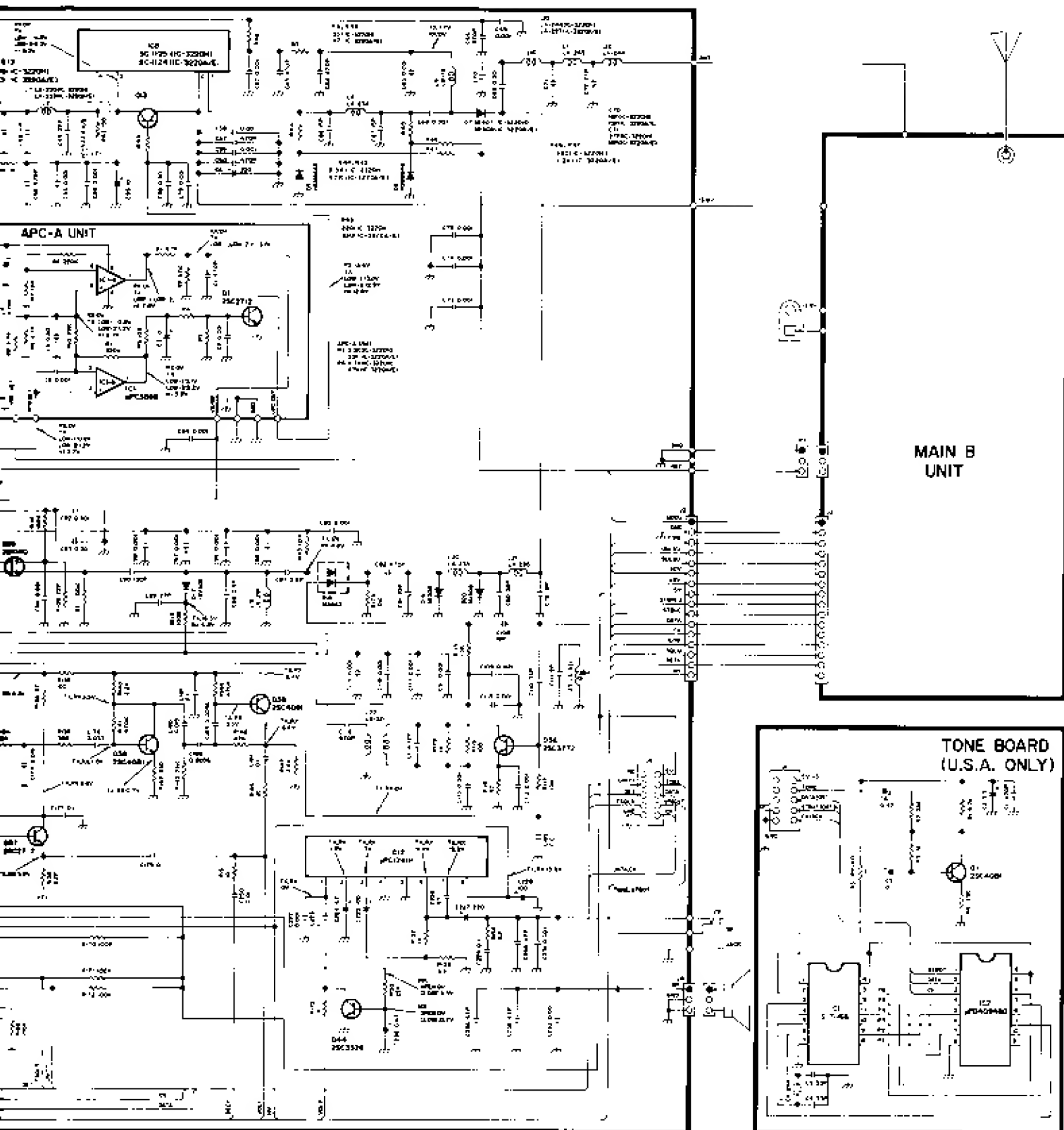


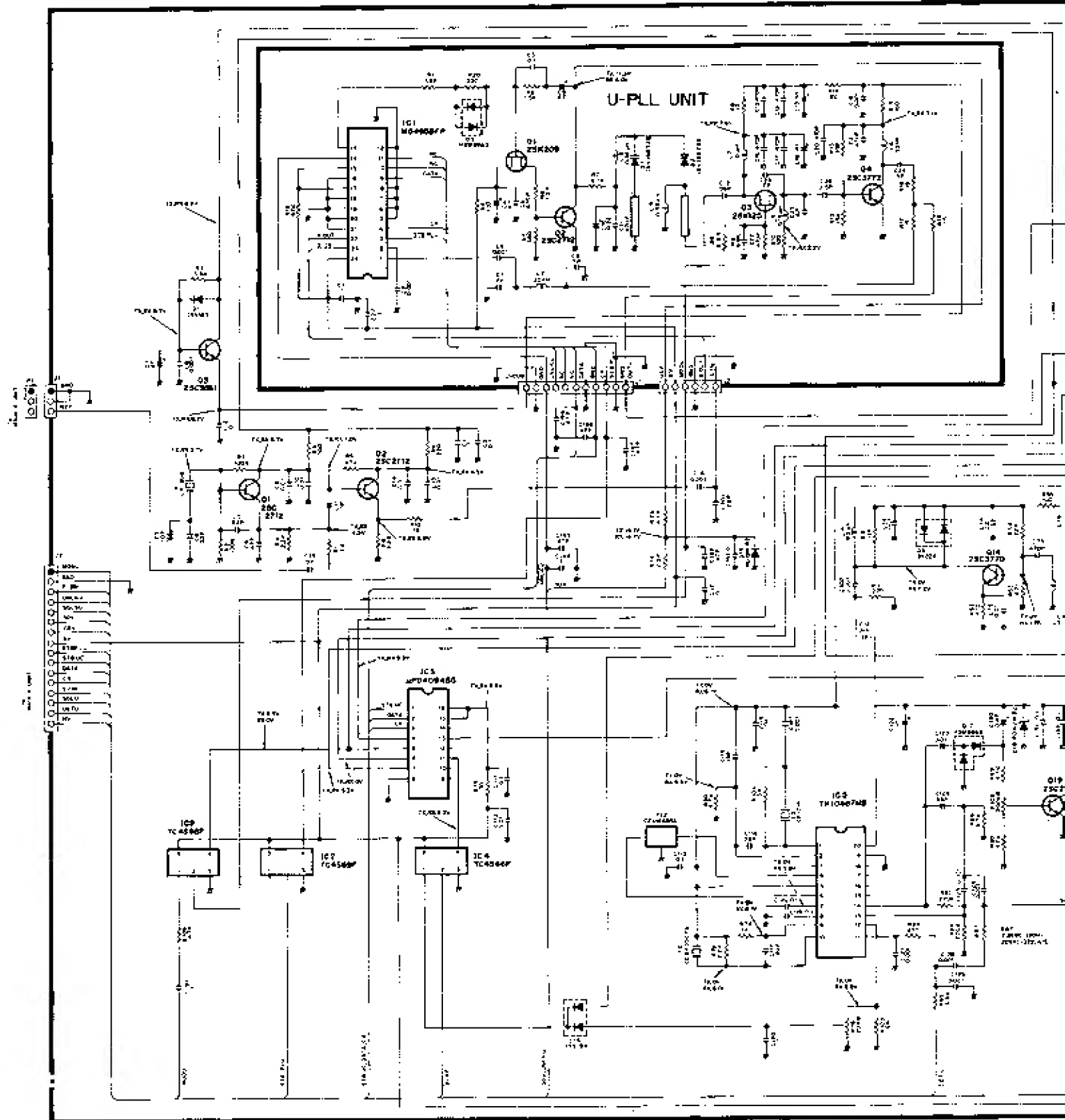




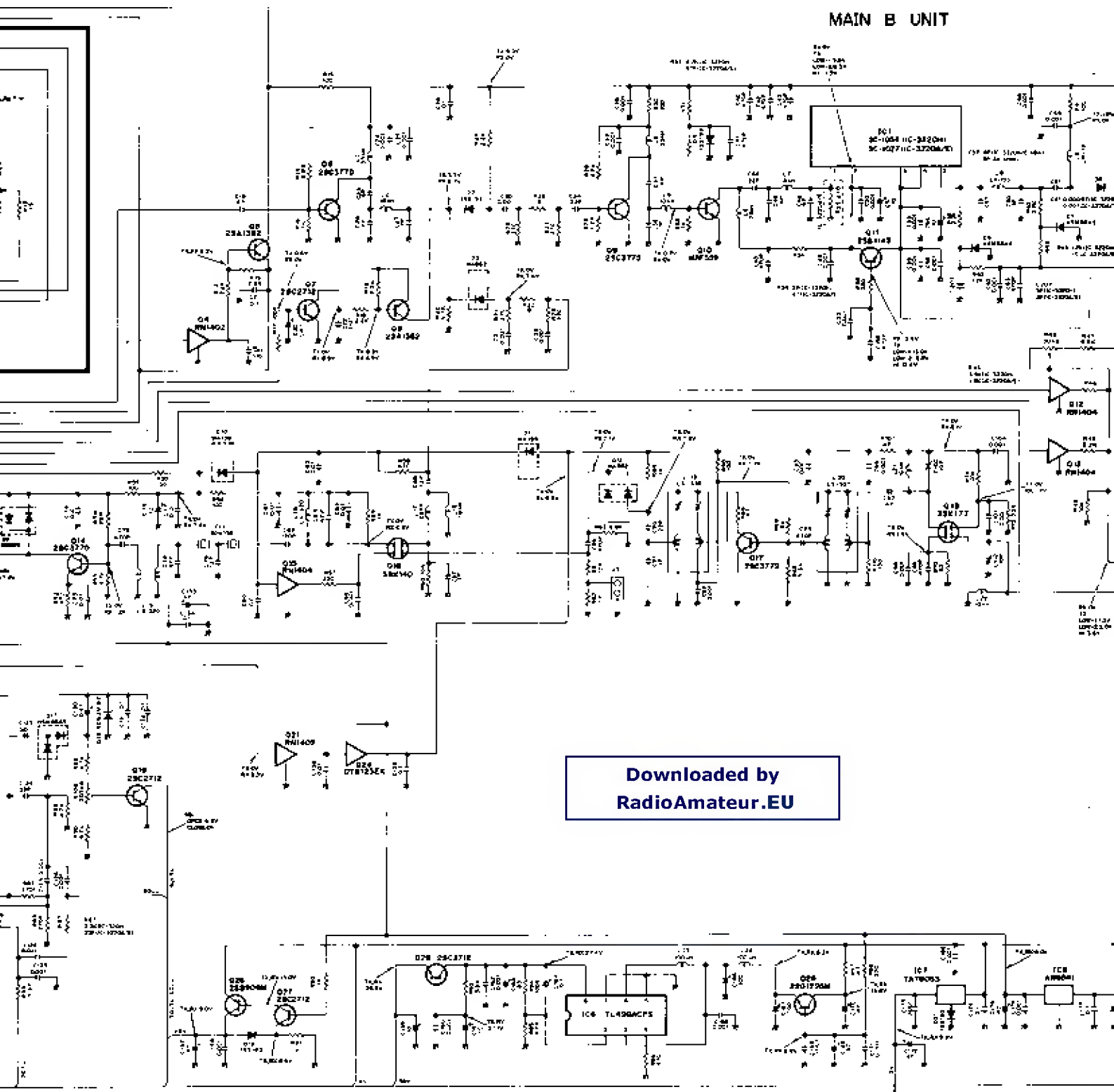


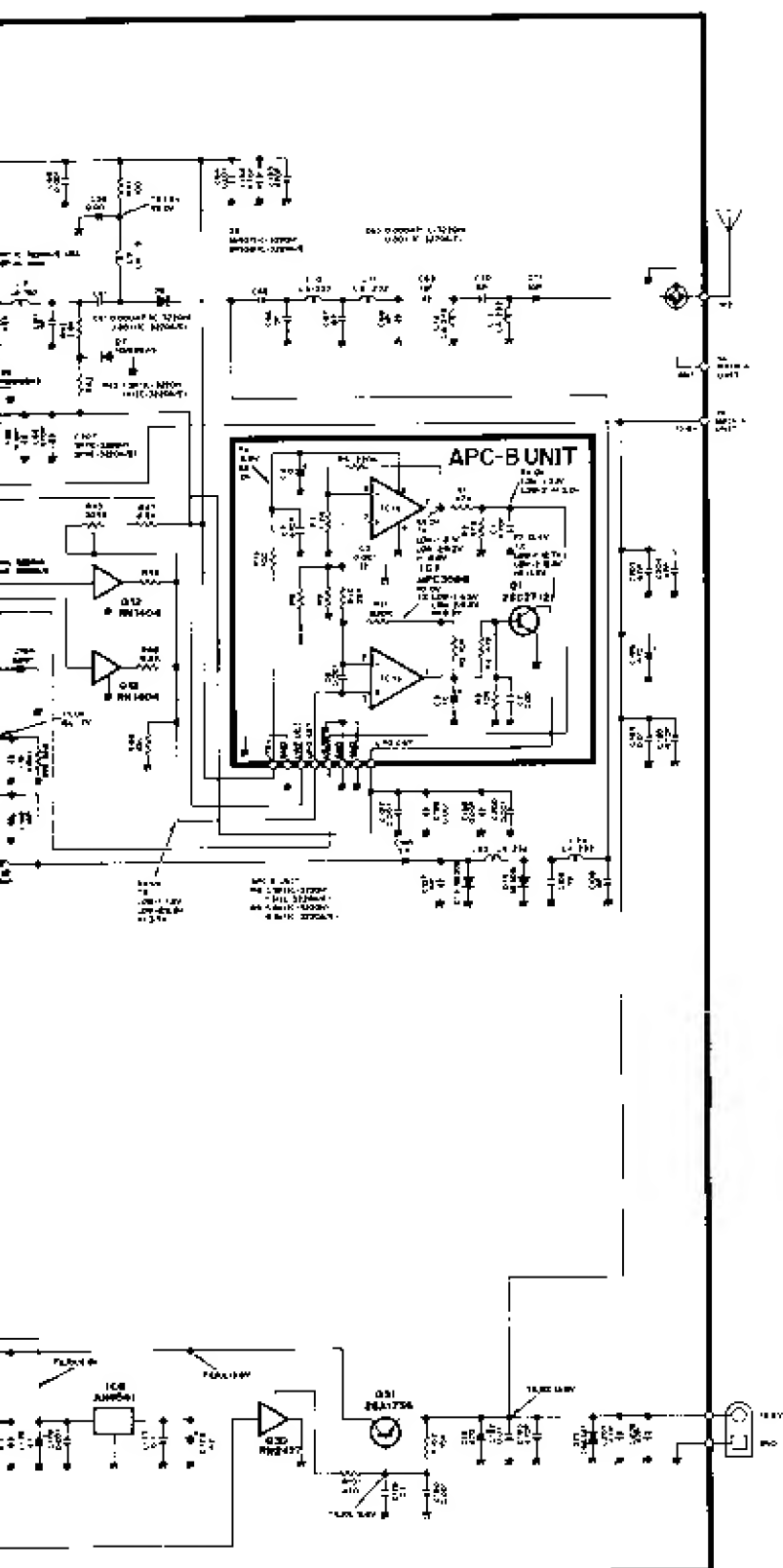




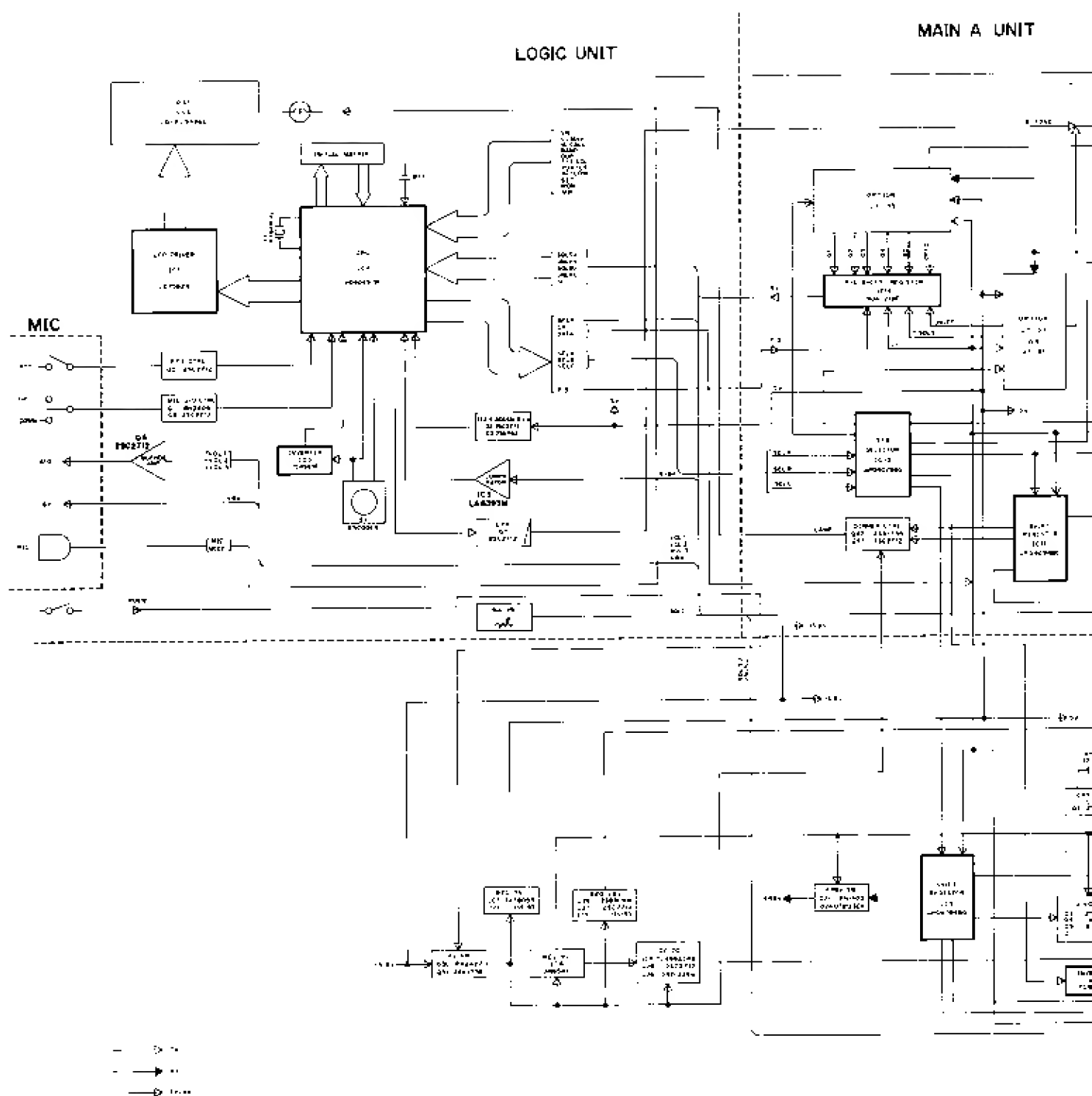


MAIN B UNIT

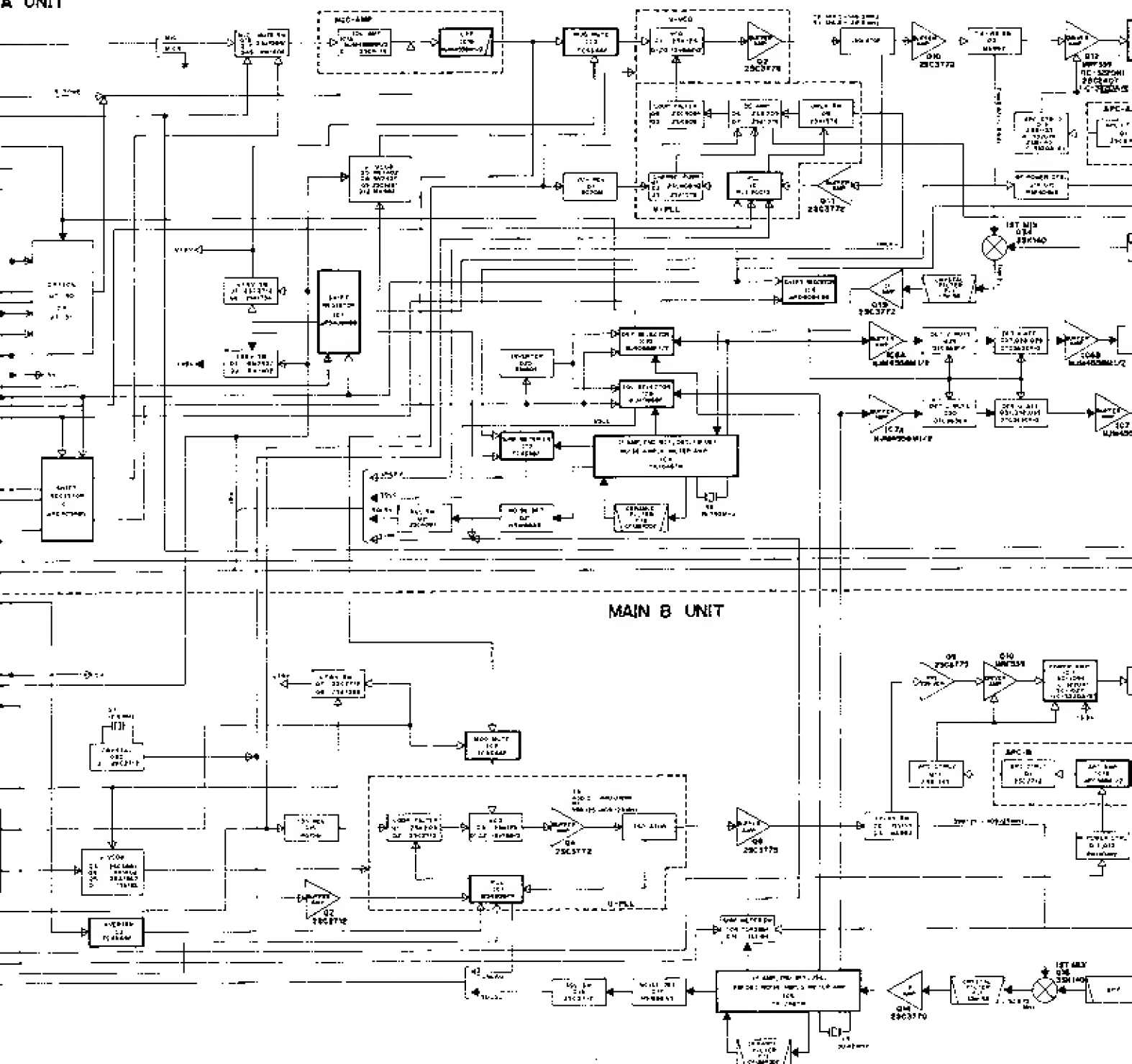




# SECTION 10 BLOCK DIAGRAM



## A UNIT



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